The Builder.

VOL. XXVI.—No. 1339.

Indian Engineering, and Social Arrangements.

TWO more volumes of papers, detailing various experiences in Indian engineering, have reached us, since our notice of those first issued from the Roorkee College press.* These, likewise, contain professional accounts of several of the great public works now in course of execution, or recently completed, in India, and are illustrated with photographs, photozincographs, engravings, and lithographs, in the same manner as the two volumes first noticed. Among the photographs is one of Marochetti's colossal angel, and Colonel Yule's screen-work, which form the Cawnpore Memorial. This, however, we perceive, has been taken some time, as it does not show the blemishes in the marble, that recent visitors deplore as becoming more and more evident. Another photograph shows us the Tonse Bridge, on the East-Indian Railway; a third, the process of launching girders for the Jubbelpore Railway; and a fourth, a grim, prim, shadowless kirk at Bungalore. A lithograph of a Presbyterian church at Allahabad, revealing a similar stiff, unartistic, unfeeling character as this last-mentioned building, is a further indication that Gothic architecture in India is in the same stage of development as that through which it passed in this country about forty or fifty years ago. More satisfactory is the exterior of an Artillery Mess-house, recently built at Meerut, in the style of a winged temple.

Among the papers is an account of the progress of the great Trigonometrical Survey. This is thus compressed by Sir Andrew Waugh on his retirement from the superintendence of the survey:—

"The almost impassable barriers of the greatest mountain range in the world, covered with perennial snow, have been unable to check the progress of our operations; for the Himalaya has been crossed and re-crossed, and our stations planted on peaks never before trodden by the foot of man; the swampy morasses and deadly forests, in several parts of India, have been traversed, and many tracts of hilly country covered by primeval jungles, scarcely inhabited by human beings, and forming almost *terræ incognitæ*, have been covered by our stations. The Little Desert has been crossed by our triangulation, and several chains of great length have been carried across the Runn and its conterminous tracts, uniting among themselves the worst features of the desert and swampy morasses and jungles of other parts of India. All these undertakings have been arduous in the extreme, and have been achieved with small numbers and most inadequate means."

Major Medley, in a paper on the Public Works Department, in like manner furnishes testimony of the great difficulties and inadequate means which militate against the ordinary sequence of success that might be expected to attend upon industry and enterprise. We are accustomed to hear Indian engineers spoken of with very faint praise. We are sometimes told they are chiefly draughtsmen with a sprinkling of young farmers, and here and there an old soldier among them. The agents and inspectors, too, are eyed askance as the officers of a system of public waste rather than public works. But Major Medley, the principal of the dusky students at Roorkee, while owning that the Public Works Department is the "best abused" in the country, contends that this censure is most unjust, and affirms that on the whole this arm of the public service does good work. He takes no notice of the young farmers, looks with friendly eyes upon the old soldier as a comrade in arms, troubles not about unscrupulous agents or wealth-accumulating inspectors, but glances carefully over the area that comes within the jurisdiction of the Department, and sees that it is as large as two-thirds of Europe. In this vast tract of country every mile of road and canal, every church, barrack, and public office, nearly every building, in fine, that is of more consequence than a private dwelling, is constructed and maintained by the Department; and, besides this, it is responsible for the exercise of a control over the numerous railways far more close and minute than that required of the Board of Trade in this country. After calling attention to the fact that India is a poor country with a very unelastic revenue, he remarks that money has to be doled out with a sparing hand after anxious consideration of the innumerable wants of the whole country; and that, instead of the public pocket being kept open for any loose-minded persons to dip their hands into, the expenditure upon public works is jealously scrutinised and controlled. Those interested or curious about the *personnel* and organization of this department, will find a succinct account of its composition, working, and powers from Major Medley's pen, and from his point of view, to which we would refer them.

Taking the contents of these volumes as an index to the precedence enjoyed by the various engineering works in India, we perceive that bridges claim the first place. The particulars of twenty-two bridges have been given. Twenty-one of the papers refer to buildings, nineteen to irrigation, eighteen to railways, fifteen to roads, nine to military engineering, four to river improvements, four to drainage, three to water supply, and two to lighthouses. One of the four papers relating to drainage is an abridgment of a report on a project for the sewerage of the town of Madras, by Captain Tulloch. In this some facts are stated that would astonish the sanitary reformers who deplore the overcrowding in some parts of London. According to the last statement drawn up by the assessor to the municipal commissioners, in one part of Madras 70,934 persons were housed in 3,433 dwellings, the average number being 20·7. In no part of the town were there less than nine souls to a house, and taking one with another there was an average of 13·8 souls to every dwelling, or a density 2½ times as great as that of the population of London. In some of the villages there is a density of 31 souls per dwelling. The homes of the natives consist of terraced or tiled buildings, running round open courtyards. The first-class dwelling will have sometimes as many as five of these courtyards, one behind another. The water supply is drawn from the wells, built in one or more of the courtyards, and is always more or less impure, owing to the escape of the sewage of the town from the badly-constructed drains into the stratum of sand that holds the supply. There are no cesspits, but every house has its privy in the back courtyard: it consists of two low brick walls, seat high, between which walls the ordure falls, and from which the watery matter escapes, and runs into the open channels which carry away the waste waters of the house into the street drain. The solid matter is removed by scavengers, who call at every house for it, sometimes twice a-day. There is a great deal of washing and bathing going on, which takes place, like the cleaning of the pots and pans, in the backyard. The drains and sewers are built of ordinary bricks, set in shell lime mortar, and are as porous and offensive as can be supposed. In some neighbourhoods the sewage has no outlet, but stagnates in open trenches round the dwellings, from one month's end to another, only getting a partial removal when a heavy fall of rain causes it to overflow the sides of the trenches and find a way for itself. But there are three outlets into which other lengths of sewers are discharged—the sea, the river Cooum, and the canal. The dry conservancy system has been strongly recommended by its supporters for Madras, but Captain Tulloch sees insuperable objections to it in the publicity of its latrines and in its great cost. Dr. Cornish, in a pamphlet urging the adoption of dry conservancy, estimates the probable cost at 2½ lakhs of rupees. Captain Tulloch first makes a calculation that the cost of the privies, urinals, and earth-sheds for the city will not be less than 26 lakhs of rupees, besides a monthly expenditure of 20,385 rupees for looking after and cleansing them; and then proposes his own scheme, which is to separate the rain-water from sewage, carrying away the former by open surface drains, and the latter by sewers of moderate dimensions. This arrangement he assumes will vanquish the difficulties attendant upon the fact that double the quantity of rain falls in India in thirty days, and sometimes in ten or twelve days, than waters England in the course of twelve months. If the sewers were constructed large enough to receive the down-pour of the rainy season they would be needlessly and ruinously costly. "While 4 in. are the utmost that has been recorded to have fallen in England during the day, upwards of 20 in. have been known to fall in Madras in the same period of time. How could Madras afford to pay for sewers constructed to discharge five times the quantity of water which the London sewers discharge?" asks Captain Tulloch. The existing large drains he proposes to use as the outlets for storm-waters, and new egg-shaped sewers with bell-mouth junctions are to convey the sewage matter from the town. This matter could be advantageously used on a low-lying tract of land to the north-west of Madras. A chart is given, based on five years' observations, showing the number of days in the year the wind blows in the town from the various points of the compass, by which we perceive that favourable breezes would blow away the smell of the sewage, in this low-lying tract, from the town, for more than nine months out of the year. The total of the estimated cost of carrying out this treble scheme is 31½ lakhs of rupees.

A manufacture of earthenware irrigation-pipes has been set up at certain stations superintended by English potters, concerning which Captain W. Jeffreys furnishes some memoranda. The pipes, it must be premised, are required for the purpose of regulating the supply of water from the canals to cultivators. This necessity has been hitherto performed by the aid of wooden boxes or covered troughs, called colabas, imbedded in the banks of rajbubas or minor irrigating channels. These were, however, clumsy, costly, apt to leak, and subject to the necessity of frequent renewal. Captain Jeffreys describes the tiles made by the natives as de-

* Professional Papers on Indian Engineering. Vol. iii., 1868; vol. iv., 1867. Edited by Major J. G. Medley, R.E., Principal, Thomason C.E. College, Roorkee. Roorkee: printed and published at the Thomason College Press. Calcutta: Thacker, Spink, & Co. Bombay: Thacker, Vining, & Co. Madras: Gantz, Brothers. London: Smith, Elder, & Co. 1866-1867.

fective, crooked, imperfectly burnt, porous, and not of uniform size. As a perfectly sound glazed earthenware pipe was expected to be the best cure for all sorts of irrigation and drainage to which they could be applied, an experimental manufacture was established at Nanou. A moulding machine, consisting of a strong wooden vertical cylinder, 5 ft. 6 in. in length by 20 in. in diameter, constructed of seesum, and strengthened with four iron bands, supported on beams securely embedded in masonry, was set up. In this cylinder is a piston worked by a wooden screw, and at the lower is a dod or die. The clay is thrown into the cylinder, and then pressed out of the dod by the action of the screw, in the form of a pipe. We quote the writer's description of the next process:—"Below the die is a moveable platform, balanced by means of weights attached to ropes running over pulleys, and arranged in such a manner that the resistance offered should just be overcome by the descending clay. When the necessary length of pipe is attained the action of the screw is stopped, the pipe is cut off with a piece of thin wire and removed to the drying sheds. Being relieved from the pressure of the clay, the platform ascends to its former position, and the operation is repeated. The cylinder full of clay contains twelve 8-in. pipes. In this manner 250 to 300 can be taken out in one day. The pipes are then kept from four to five days under sheds to dry; if exposed to the sun or wind, they crack or lose their shape." The burning is the next process. Captain Jeffreys has designed a kiln of great depth of flue and thickness of arch, and suggested the use of fire-clay for cement instead of ordinary clay, which improvements he believes will put an end to the frequent falling in of the arches of the flues whereby so many of the pipes were at first cracked and broken. The pipes manufactured at Nanou are esteemed superior to those turned out of ordinary tile-making machines. The pressure to which the clay is subjected, on passing through the cylinder, is accredited as the cause of this superiority.

One of the most interesting papers is entitled "Engineering in the Derajat." It is written by Major Medley. The Derajat is a slip of country some 250 miles in length, lying between the Indus and the Suleiman Mountains. Where the river approaches the mountains, it is not more than fifteen miles in breadth; where it recedes, it is fifty miles broad. In the southern district canals have been cut from the river, which there runs between low banks, and the country, being well cultivated, is also well peopled. Northwards, however, the river runs between high banks, and there are no inundation canals to moisten and enrich the soil. This upland district is stony, intersected by numerous dry torrents; has a hard, stiff, clay soil and one of the dryest climates on the earth's surface; consequently a scanty crop of millet is all that is got out of the ground. Between the few villages is a coarse, scrubby jungle, upon which the barren hills look down with more desolation. There are more prosperous valleys among the hills, on which reside a lawless population ever ready for a raid into the plains. When Major Medley took up his quarters in this country there was not a map of it in existence, nor a mile of road in it; and the soil was either deluged with water or parched with thirst according to the season. He describes the population as scanty and the labourers as few when he set to work to survey the country and prepare a map. The natives of other parts, he records, looked on the Trans-Indus with dread, and could only be induced to cross the river by dint of much persuasion. Camels were the only beasts of burden, and there was not a single wheeled vehicle in the Derajat. Notwithstanding these drawbacks to rapid progress, a tolerably correct survey was executed by means of polygonal traversing with the theodolite and the filling up of details by the prismatic compass and chain in the hands of native surveyors, showing the course of the river, and the positions of the canals, towns, and villages. This accomplished, projects were laid out for the extension and improvement of the canals, most of which, with some others, have been executed by the major's successor, who was at that time his assistant; and the prosperity and revenue of the district, accordingly, improved. A system of roads is in the course of being worked out, in which there is a main line of road running the whole length of the two districts through the principal towns, and generally parallel with the river, and a series of cross-roads connecting the frontier with the first-mentioned line of communication. Here is a fragment of this pioneering experience:—

"These roads were laid out from the map, or by means of special traverses made from place to place; they were then cleared for a breadth of 20 ft. or 30 ft., and inequalities of surface tolerably levelled, while temporary wooden bridges were made over the canals. Where the jungle was very thick it was cleared for some distance on both sides of the road. As money was not forthcoming to raise these lines clear of inundation, many of them were annually flooded, and repaired immediately after the subsidence of the river. For the passage of the dry hill torrents, the sides were sloped down and paved; causeways, in some cases, substituted as a cheap and efficient makeshift in lieu of bridges, which would have been practically not required for more than perhaps ten days in the whole year."

Another piece of experience detailed deals with the means taken to turn back the river from a passage it had newly made for itself, for a length of sixty miles, through the heart of the district, on which occasion one of the three cantonments from which the frontier garrisons are served, was cut off from the military posts that it was appointed to support, and 500 square miles of the best land swamped. A thousand labourers were brought to the spot from Hindostan and the Punjab, and, aided by labour in the district, were set to form an earthen embankment across the mouth of the inundation, so as to keep the waters back. Scarcely was the work finished when the river rose and made its way through in eleven places. Nothing daunted, these breaches were defended by spurs and brushwood piling, and when the waters fell again they were closed so successfully as to resist the next rise. In the following year, a heavy rain had so materially increased the bulk of the waters that they again swept through the embankment in several places, carrying away the cantonment of Dera Ghazee Khan, and flooding the city. Many lives and much property were lost on this occasion. The third year brought a rise considerably less than the average, consequently the new work had time to consolidate before being put to another severe test, and has since stood well. It cost rather more than a lakh.

An account of the Hastings shoal, in the Rangoon river, by Mr. Hugh Leonard, is another descriptive sketch of a local difficulty and its removal. A paper "On Bridge Foundations in Sandy Rivers," by Mr. R. G. Elwes, comes under the same category. Lieut. MacNeile furnishes an able description of the Double Island Lighthouse, constructed under his charge; and there are papers "On the Mathematics of Engineering" in these Oriental volumes that are of professional interest and value.

In the May number for the current year there is an extract from a speech of the Viceroy, in which official mention is made of the numerous irrigation works in hand, or about to be commenced, for the undertaking of which thirty engineers were despatched from this country a few months ago. Among these, in the Punjab, is a new canal from the Sutlej, the remodelling of the Baree Doab Canal, the improvement of the Western Jumna Canal and its extension into the arid districts near Sirsá, and surveys for projects for new canals for the country between Firozpoor and Mooltan, and for the extension of those on the right bank of the Indus. In the North-west Provinces, a new canal to irrigate the Agra and Multra districts is already partly marked out, and the remodelling of the Ganges Canal is in contemplation, which will comprise a continuous water communication from Lahore to Delhi, Agra, the Doab, and on into Oudh. At Rohilkhund there are to be both irrigation and drainage works, and in Bundelkhund three rivers are to be placed in the hands of engineers for the utilization of their waters. In the province of Oudh a canal is in contemplation, to be taken from the Sarda, that will not be on a smaller scale than the Ganges Canal. In Bengal on the north, the Gandak river is to be utilized, and in Nuddea it is proposed to form a canal from the Ganges to Calcutta. Navigation and irrigation works are in store for at least three other districts in this part of India, and the canal from the Soane, undertaken by the East Indian Irrigation Company, is now about to be executed by the Government. In the central provinces further irrigation works are in contemplation. Madras is now likely to see the completion of the great works connected with the anicuts on the Godaveri and Kistna, and two very large tanks near the town are in course of execution. The irrigation from the Pennair river in the Nellore district is to be forthwith extended. The survey for a canal has been made, which is to turn the waters of a river in the higher ranges of the Travancore mountains into the plain of Madura. In the Bombay Presidency a large canal from the Indus to irrigate the Hyderabad collectorate, and a canal from the Tapté, are among the most considerable works in contemplation. Surely all this enterprise augurs a good time for India. In this number, too, are two designs for the ornamentation of the walls of rooms in Indian houses. In one case a surface of rich cream colour is bordered with a few green, black, and white lines, with floral scrolls at the angles; and in the other a green surface is bordered with red and yellow. These are given for the benefit of those in up-country stations where it is difficult to get suitable decorations. They have been prepared in the garrison engineer's office, Calcutta. After the walls are enamelled with lime plaster, a thick curd, *orchana*, mixed with lime-water, or simply milk and water of equal proportions, is to be applied to them to form a body. The water-colours are directed to be mixed with milk and water, white of eggs, and pure China glue in a liquid state, and then laid evenly on the walls. The patterns are to be stencilled on this surface.

THE LESSONS TAUGHT BY THE ABERGELE COLLISION.

The inquest held on the sufferers by the Abergele disaster has been protracted to a length demanded rather by the magnitude of the calamity, and by the public excitement that it has awakened, than by any other cause. Into the details of the evidence and of the verdict we do not propose to enter. The *minutiæ* are beyond our province, and the special circumstances of the case, so far as they are independent of any questions of construction, are rather subjects for the consideration of the daily journalist, or of the papers more especially devoted to railway intelligence, than for our own.

There are, however, two independent considerations to which we have, more than once, more or less distinctly adverted, on which this great calamity sheds a lurid and warning light. The one is, in the main, a constructive question; the other is financial.

In all mechanical arrangements the question of "clearance" is one in the treatment of which the workman delights to show his skill. In some of the most beautiful productions of the lathe and the tool bench,—such, for instance, as Mr. Cotton's machine for weighing sovereigns,—the whole action of the apparatus depends on delicate and accurate "clearance;" and successive movements of different parts of the machine through the same space follow one another with the precision of clockwork.

In a vast and complicated system of mechanical movement, such as is presented by a railway, it is obvious that the question of "clearance" must be dealt with in a very different manner from that which is appropriate to the arrangement of a simple machine. Where any movement depends on a preceding movement, after the manner of cause and effect, precision is to a great extent self-secured, and a delay in the first motion is not attended with danger, because the later movement waits upon the former. But where independent sources of motion produce action which, if not harmonious, must be destructive, the conditions of the problem are altogether reversed. What was, in the former case, a wise constructive economy, becomes, in the second instance, a foolhardy rashness. In the timing of railway trains almost every source of disturbance becomes possible. The same space, identically the same, has to be frequently passed over by bodies of great bulk, great length, great weight, and moving at very high velocities. The only tie to regulate the successive timing of the transit of these bodies is human care. The case is not like that of street traffic. Let a traffic propelled by horses be as dense as that of Cheapside, or as rapid and dashing as that of the Corso at Naples, and yet there is a natural element of safety in the instinct of the horses, as well as in the practised skill of the driver. Collisions occur, it is true, but they form the exception and not the rule. Moreover, when they do occur, they are often slight—mere warnings, and that not too late, to slacken speed, or to give a wider sweep round a corner. Each independent source of movement, and thus of danger, has its own independent instinct of self-preservation, and by the action of this common instinct much of the danger arising from independent origination of motion is avoided.

In the case of railway trains it is widely

different. The iron horse has no instinct. It will rush as blindly on an invincible obstacle as it will over a perfectly clear course. The instinct of the driver remains, but his power is greatly diminished. He has no possible means of avoiding collision, except by stopping, or by reversing, the longitudinal movement of the vehicle which he directs. He requires a certain time, and generally a considerable distance, in order to do this. The attention of the engine-driver, unaided by the instinct of his steed, has to be kept constantly on the stretch; and instances are numerous in which *no* attention on his part can inform him of threatening danger in sufficient time to enable him to adopt the only means in his power to lessen or to escape it. In sudden fogs, in running round curves, and under circumstances which are more numerous than railway travellers would care to have particularised, the safety of a train is left pretty much to the PROVIDENCE OF GOD. The driver thunders on at forty or fifty miles an hour, keeping the best look-out he can, trusting that the coast is clear, but possessing the intimate knowledge that if a rail is up in such a spot, or if a wagon is on the line in such a station, collision and destruction are unavoidable.

It must be remembered, moreover, that the engine-driver does not time his own train. If he alters his regulated speed he is liable to be called to account. If he slackens, for instance, to run with less hazard round a blind curve, he disarranges a calculated series of movements, and may cause the very danger which he endeavours to shun. The independence of his movements is strictly limited. He does not even leave a station *as he ought always to be bound to do*, by the indication of the clock, but by the signal of the station-master. An important and redoubtable personage comes to the station just a little too late,—distanced, it may be, by the error of his watch, or by some slight obstruction to his carriage, in that race for the last minute with which busy Englishmen usually amuse themselves in the run to the station; or a large family, or a helpless old lady, arrives in time, indeed, but incumbered with a many-packaged luggage, which claims numerous and unattainable porters. In either case the station-master relents. He prefers private convenience, personal civility, avoidance of black looks or hasty words, to punctuality and the public safety. He detains the train till the fuming director, or the anxious *pater familias*, is comfortably ensconced in his seat. What may not these three minutes cost?

Now it is obviously undesirable that, where the sources of danger are so many, and the check is so slight, ample "clearance" should be allowed. It must be remembered that the velocities of the different kinds of trains, which follow one another over the same line of rails, differ so materially, that the result of an express train overtaking a luggage, or cattle, or ballast, or mineral train would be as disastrous as that of a collision with a train that was at rest. We have enormous weights propelled at great and varying velocities over the same space, each started by independent volition, and all regulated by no very distinct laws of sequence. It really speaks volumes for the practical sense and anxious care of railway servants that accidents are so rare.

For, it must be remembered, even the most indefatigable student of Bradshaw can never calculate the dangers he has avoided. The trains as to which the public can ascertain the timing, are the passenger trains alone. How shortly his carriage has been preceded, or may be followed, by a goods train a third of a mile long, propelled by three powerful engines, the first-class passenger, happy in his unconsciousness, has no means of judging; and the more the shareholders are congratulated, at their half-yearly gatherings, on the increase of their goods and mineral traffic, the greater is this invisible danger; invisible, it may be, not to the toil-worn and anxious staff, but to the comfortably conveyed and unconscious subjects of the peril. An accurate notation of the times at which trains pass certain spots on some of the most frequented railways could hardly be read without a shudder.

In all this there is much for which no one is to be blamed. The growth of traffic is one of the most valuable features of the railway system. It has been as unexpected as it has been stupendous; as great (or greater) a benefit to the English public as it has been to the railway proprietary. In all things that grow, the moment of crisis is hard to predetermine. What amount of traffic may be safely taken over one pair of rails, and what is the actual addition that involves danger, no statistician can hope to define; for it is not a matter that admits of any universal rule. Much in each case must depend on mechanical conditions, on the gradients of the line, the power of the locomotives, the worthy state of the rolling-stock; more must depend on the brain, the eye, the habit of control of the manager of the traffic. But what is certain is this: there is a point, towards which the vows of the shareholders would urge the traffic of every line, at which it is inconsistent with public safety to carry passenger traffic and merchandise traffic over the same "metals." There is a maximum amount of service to be exacted from a single line of railway. There is an amount of traffic, possible and desirable, which demands a fourfold line in place of a twofold one. To go far beyond that point, without making that provision for the public safety, is to endanger the traveller. The remedy is costly; but it can only be postponed at the risk of a far more costly evil.

In the mean time there is much that may be done,—and *must* be done,—in the way of increasing the accommodation now afforded by sidings. In the Abergele case the train, into the detached portion of which the express dashed, was nearly as long as the siding into which it should have run. This siding, moreover, was partially occupied by another train. It is said that there was a second siding, of some 100 yards long,—but all those who are at all familiar with the working of railways know that the running of trains in and out of sidings, and especially the dividing and re-uniting of long trains, are costly, cumbrous, and delicate operations, which every careful manager will take pains, as far as possible, to avoid. The construction of long parallel lines,—portions of a future fourfold way,—in which slow trains may be conveniently accommodated, so as to place them out of any danger of collision with passenger-trains, is an expense which every well-to-do company must be prepared annually to encounter.

With this constructive remedy must be combined the faithful and rigid use of the electric telegraph. When our English railways were first opened, the most ordinary cause of accident was the inexcusable stupidity of allowing two trains to meet on the same line, advancing in opposite directions, as if for the very purpose of a charge. When single lines were introduced, it was supposed that the danger of accident, from this cause, was much increased. The opposite proved to be the case. As all danger that is foreseen is greatly diminished by due precaution, the obvious danger of a collision between an up and a down train on the same line was guarded against by the proper use of the telegraph. The up train X was not allowed to leave the station B until the down train Y had arrived. By the application of this simple rule of common sense the working of single lines was rendered at least as safe as that of double ones. Collisions on branches thus worked are simply impossible.

There can be no reason adduced, and there ought to be no excuse allowed, for the neglect of a similar precaution on all passenger lines. A certain, and sufficient, "clearance" should be allowed for every train. It is not for us to limit this clearance in minutes, although it is certain that it must to a certain extent be determined by the velocity of the trains. A rapid express, stopping at few stations, ought to have a greater length of clear unoccupied way in front of it, than is necessary for a slower train stopping at every station. But the clearance, once determined, should be enforced by the telegraph. The train Y should not be allowed to pass the station B until it was known that the train X had passed that point. To ensure this, the train Y should not be allowed to leave the station A until the passage of train X through station B was telegraphed up by the station-master. In the case of an express train that is not intended to stop at certain stations, the same rule should absolutely apply. Let us take Z to be an express train. Its starting from the station A should be dependent on the receipt of a telegraphic message from D that train Y had left that station. To insure punctuality of departure, let us consider that the proper time for the starting of Z from the terminus would be three minutes *after* Y ought to have left station D. As the hand of the station clock indicated that minute, the express should start, independently of any order or signal from the station-master, but subject to the exhibition of a telegraphic notice that D was clear. The running of the express through stations B and C would thus be unchecked, provided no danger signal was shown at either of these stations. At F let us suppose train Y would run into a siding, and then Z would pass, without stopping, on the main line; but it would only be allowed to do so if it had received the intimation by the signal of station E that the line was clear at F. Until receiving the signal that train Y was safe in the siding at F, the station E would be blocked by the danger signal, and Z would be consequently detained there. During such detention station D would in its turn be blocked by the danger signal, so that no train could pass it towards F. By such a system as this, collision from overtaking would be rendered as impossible as collision from meeting may be considered to have been rendered on single lines perfectly worked.

It may be urged that the rigid enforcement of rules of this stringent character would interfere with the frequency of trains. "It is all very well," the manager of a line will say, "for an engineer sitting in his office to prescribe rules for the working of a line. As to absolute safety for passengers, as far, at least, as collisions are concerned, no doubt it would be thus secured, but how are we to conduct our traffic? We are at our wits end already how to divide the twenty-four hours. We are obliged to run it fine every now and then; and if we are to have Parliament interfering, and rules of this kind laid down, so far from being able to increase our traffic, we shall not be able to carry what we have. It may be all very well for the passenger trains, but what is to become of the heavy traffic?"

If the case be thus brought before the public,—and we are anxious to state it fairly,—we have little doubt as to the verdict. On the one hand we propose certain regulations, faithful adherence to what would render railway collisions impossible. This cannot be denied. But it is tacitly replied that 'it 'is inconvenient for the companies to adopt these rules. The goods traffic may be checked by their enforcement. That is as much as to say that the amount of fast and slow mixed traffic, which is carried on a single line of rails, exceeds the maximum that may be safely so conveyed. To squeeze a little more service out of the permanent way, the safety of the passengers must be risked. For if it can be shown that a practical regulation, which may, indeed, place the running of successive trains somewhat further apart, would render collision impossible, and that such a regulation is neglected solely because it thus "wastes time," or enlarges the distances between the trains, the question is broadly stated. It is one between safety and dividend.

Between certain safety and uncertain dividend, that is to say. For this brings us to the second consideration to which we referred, that, namely, of finance. Our recent remarks on this subject* received a sad and pregnant comment at the late half-yearly meeting of the proprietors of the London and North-Western Railway. The gloom of the Abergele calamity brooded over the meeting. There was evidence of the honest, human sympathy with which Englishmen are always accustomed to regard any great loss of human life. But with this generous and disinterested feeling was mingled emotion, not ungenerous, indeed, but of a widely different order. The commercial question could not be altogether lost sight of beneath the gracious mist of sympathy. Such was the dividend earned, subject to costs and damages from the recent calamity. Very freely, we doubt not, would the great majority of the shareholders, if the question could have been submitted to them, have subscribed the amount of the dividend to prevent such a sacrifice. But the sacrifice had taken place, and the shadow of the question of compensation to the representatives of the sufferers could not fail yet further to depress the spirits of the shareholders.

This risk of a great financial disaster is one as purely gratuitous as is the risk of collision itself. It may be avoided by every company, as we recently took occasion to show, by the simple plan of making every railway ticket at the same time a policy of insurance. Whether a direct addition to fares which are almost everywhere below the parliamentary maximum, should be made, to cover this insurance, or not, is one of those questions of detail into which we do not

* See p. 613, *ante*.

feel called to enter. It is certain that, if it can pay an independent company to insure a given proportion of railway passengers, it must pay the carrying companies to insure them all upon the same terms. It is probable that the mere simplifying the question of damages by an amicable assessment of their amount would pay the companies,—not for incurring new risk, but for defining the risk which they already run. The worst would be known in any case, and it would be pretty much the fault of the companies if that worst ever occurred.

All invidious distinctions between different classes of travellers, or different grades in the social scale, would be obviated by this plan. We should no longer be scandalised by the spectacle of juries awarding one amount of compensation for the death of a poor man, and another for that of a rich man. The proportionate sums already assured for first, second, and third class passengers might be adopted, or might be modified. License might be given for the insurance of any individual for a higher sum at will. We repeat, that we not do wish to enter into details as to which there can be no difficulty, although there may be ample room for discussion or for modification; but as to the principle, we think there can be no doubt. We urged its adoption *apropos* of the exhibition of an unusual instance of ability and of success in the conduct of a line which was once the very byeword of the traveller. We repeat it, after the awful echo to our recommendation that yet tingles in the ears from Abergele. Will shareholders prove themselves still neglectful of their own interests? Will they allow suggestions so obviously to their interest to be neglected, because they come from an impartial, disinterested source, instead of being the projects of any of their own officers? If they do, they will have only themselves to blame when dividend is absorbed as deodand. More than that, in any future case (and would that such may never arise), it cannot fail to be brought before the notice of a jury, that a mode of rendering collisions impossible has been made public in our pages. If collisions occur in neglect of this precaution, and in defiance of this warning, the responsibility of all concerned will be aggravated in no slight degree. We do not say that the mere neglect to establish and to enforce such a rule, when its practicability and its value had been once clearly pointed out, would change a verdict of manslaughter into one of murder, but we cannot deny that it might do so. The failure to use any certain precaution would be animadverted upon by every high judicial authority in no mincing terms. The criminal nature of an accident, or rather of the neglect that caused it, might be held to depend very intimately on such an omission. The civil responsibility, which is ordinarily measured by damages, might no less be held to be augmented; and the shareholders of a line which, six months hence, shall neither regulate the succession of its trains by telegraph, nor assure the lives of its passengers on their tickets, will assuredly deserve little compassion if, in the event of any accident by collision, the half year's dividend should be entirely swallowed up for compensation.

SKETCHES ON THE TWEED.

THERE are very few districts of country in the British islands possessed of more interest to the artist or the antiquary, or even, as we shall try to show, to the sanitary engineer, than the valley of the Tweed. The river itself is naturally of unexampled beauty and purity; and it has been the subject of more poetry, we suppose, ancient and modern, than any river of its class in Europe, excepting, perhaps, it may be, the Rhine. All along its banks we shall find ancient feudal castles proudly situated, like Norham or Neidpath; and princely modern palaces, like Floors Castle and Eildon Hall. Ruined abbeys there are of rare beauty, like Melrose and Dryburgh, closely allied with ruined mosstroopers' towers like Darnick and Smailholm. There are also some splendid bridges and railway viaducts: take Kelso Bridge as an example of the one, and the Berwick Viaduct of the other. Nowhere in Scotland have we seen such picturesque villas and gentlemen's seats. Then there are a variety of pretty, old-fashioned towns like Jedburgh and Selkirk, as well as their modern manufacturing compeers, like Galashiels and Hawick, snugly situated on the tributary streams. With all this there is still a sylvan beauty and an abundance of fine upland-hill scenery which make the valleys dear to all lovers of nature; and we must never forget that the whole atmosphere, so to speak, is redolent of the genius and the whole landscape teeming with the memorials of Border chivalry, poetry, and romance. It is almost unnecessary to mention Abbotsford or the name of Sir Walter Scott, for it would be as easy to go to Stratford-on-Avon and try to forget Shakspeare! There is not, we venture to say, a morsel of ground or a rivulet of water in the old Borderland that Sir Walter Scott has left without his footprints or his stepping-stones. He belonged to the clan of the bold Buccleuch; he was sheriff of Roxburghshire; Melrose Abbey was the scene of his meditations, the haunt of his muse, and the shrine of his inspiration. In Dryburgh a plain granite slab, under the window of a ruined chapel in the transept aisle, will long point out the spot where they have deposited his bones. The very railway which traverses the district is called the Waverley route. And it is curious to tell that the rustics of the valley will faithfully and readily show to the admiring stranger the identical spot in the fairy glen where Halbert Glendinning met the White Lady of Avennel, and the actual ford on the Tweed where that amiable phantom used to duck the Dominican friars.

The real facts of the case with regard to Sir Walter Scott and the literature of the Borders may be summed up in one sentence,—he has exhausted the theme. For the ancient poetry of the district we must go to the Border minstrelsy; for the modern renaissance, to "Marmion" and the "Lay of the Last Minstrel;" for the manners and customs of the people, to the "Monastery," or the "Bride of Lammermoor." Who does not remember, for example, the stirring lines in the opening canto of "Marmion?"—

> "Day set on Norham's castled steep,
> And Tweed's fair river broad and deep,
> And Cheviot's mountains lone."

We cannot venture to speak of his immortal delineations of Border character in the Waverley Novels; for the poetry and romance of the Tweed is not exactly our present subject. We happened to pass a week or two in this delightful district during the course of the summer, and we made a few stray notes, which may be of value to our general readers. We cannot hope to say much that is new to professional men, either with regard to its archæology or its architecture. The pollution of the Tweed does not differ very much from that of certain other arterial streams in this county; and the condition of the manufacturing towns is not so bad as we might, judging from previous experience, have been prepared to expect. At the same time, such disconnected observations as we have been able to make will possess this recommendation, that they are done in an impartial spirit and independent of all local influence or authority. Of course we must try, as we have said, to eliminate as much as possible the romantic element from our subject, and stick as far as we can to the scientific character of the facts. To this end we shall first of all say a few words concerning the physical aspects and hydrology of the river itself.

The river Tweed, then, has usually been ranked as the fourth in importance of the Scottish rivers; but if we look at it according to the extent of country which it drains it surpasses them all, except the Tay. The counties which it passes through are Peebles, Selkirk, Roxburgh, Berwick; and with some trifling exceptions these districts are entirely within its drainage basin, which has been estimated on the data of the Ordnance Survey, to contain an area of 1,870 square miles.* Its tributaries, and the hills which they drain, are too numerous even to mention; but we may state that from its source at Tweedsmuir, in Peebleshire, to the outlet on the sea at Berwick it performs a run of about 100 miles irrespective of windings. About one-third of this distance is overtaken in Peebleshire, and about another third in Roxburghshire. After leaving Roxburghshire, the Tweed becomes partially an English river. It divides Berwickshire from England till within 4½ miles of its outlet; then it bids adieu to Scotland altogether, and flows between the county of Northumberland and the liberties of Berwick, where it fulfils its destiny by finally mingling with the waters of the North Sea. The Tweed and the Clyde, we may add, for many miles from their source flow nearly in a parallel direction; and it is worth mentioning that there was, at one time, a project conceived by the Tweedside proprietors of turning the Clyde into the Tweed, with the view of rendering the Tweed navigable. This must have been, of course, before Glasgow had acquired its present character for commercial greatness, and certainly many generations anterior to the splendid engineering operations which have made the Clyde itself navigable to the Broomielaw.* This extensive run of the Tweed is also accompanied by a corresponding fall. From its source to its embouchure, where it is crossed by the celebrated viaduct of the North-Eastern line, the river possesses a total aggregate fall of about 1,500 ft. Of this fall 1,000 ft. are obtained when it reaches the town of Peebles. In the very long run, therefore, as compared with the fall, between that town and the sea, the river might be expected to become sufficiently sluggish in its current as to be, at least over a considerable distance of its extent, navigable. But this is not the case. It accomplishes its remaining fall of 500 ft. in so many separate descents, so far apart, and of such gentle gradients, that it seems destined by nature to be altogether a stream of woodland beauty, and a total stranger to the inroads of river-steamers or even of fishing-sloops.

This natural incapacity of the Tweed for commerce and navigation from the sea upwards becomes more apparent when we examine the nature of its bed. It abounds in deep pools and in long stretches of scarcely perceptible current, yet in almost every sweep of it which can come under the eye in the course of its beautiful curves it presents one or more soft rapids, sometimes of considerable length. The banks, also, which are thickly strewn with pebbles, or small boulders, and gravel, and which are chiefly formed by the action of these rapids, are very inaccessible beaches for boats. Again, in one instance, at least, two or three miles above Kelso, there occurs a perforated, broad, greywacke dyke, which crops up quite across the channel. All these circumstances render it both naturally unfit and artificially unimprovable for navigation. At the same time ferry-boats are stationed upon it in certain localities, such as at Dryburgh Abbey, where there is ample depth of water; and the small flat boats, used in salmon fishing (provincially called trows), are freely navigated even over the fords. A few miles above its embouchure the river loses its prevailing character, and becomes capable of admitting sailing craft of slight tonnage.†

The tidal flow reaches beyond Norham Castle, ten miles above Berwick; and up to New Water Ford, four miles below this, it produces sufficient depth to float, at any time, a vessel of thirty tons burthen. The real navigation of the Tweed, however, is all confined to Berwick; and as to either capaciousness or depth of sea-room and harbourage afforded for it, might be quite as well accommodated in many a nameless creek of the rugged and indented Scottish coast. The fact is, that Berwick-upon-Tweed has long been regarded, not so much in the light of a seaport as a pleasant watering-place. While the Tweed was thus undisturbed by traffic, it was, up to a recent period, nearly as much untinctured by the liquid outpourings of manufactories; indeed, it has always had, up to a recent period, a clean, shining path of gravel and pebbles; and thus it almost everywhere possesses a remarkably limpid and sparkling appearance. This quality, combined with the majestic and placid flow of its current, and with the prevailing beauty of its banks, long ago suggested the poetical name of the Silver Tweed, with all the serene and joyous images which it recalls to the tasteful observer of landscape.

It would be easy to dilate, if this were the place, on the beauty of the flowers and gardens which adorn the verdant banks of this beautiful river:—

> "What beauties doth Flora disclose,
> How sweet are her smiles upon Tweed!"

So sang the poet more than a century ago, and

* These figures are quoted from "Chambers's Encyclopædia," vol. iv. p. 602.

* "The main water-shed of the country between the Tweed and the Clyde crosses at one part a low valley through which it would be easy to cut a channel from the Clyde. Indeed, if good care were not taken of its banks, the Clyde would ere long dig the channel for itself, and flow into the Tweed."—*Vide* "The Scenery of Scotland, viewed in Connexion with its Physical Geology." By Archibald Geikie, F.R.S. London, 1865. P. 148.

† *Vide* Fullarton's "Gazetteer of Scotland," article "Tweed."

his description is still exact and true to nature. There are valleys on the Tweed so richly wooded and so luxuriantly laid out that they give the spectator the impression that he is traversing a series of beautiful private orchards more than anything else; and we have no hesitation in saying that we seldom have seen such splendid old forest trees, such silver birches and stately oaks, as adorn the policies of the principal estates on the Tweed. In scenes of such exuberant beauty it is idle to particularise. Nevertheless, we may venture to point out the beautiful and stilly sheet of water, with its richly-embowered banks, which is partly retained, and to that extent formed by, the mill-weir at Melrose. This is to our taste one of the sweetest sylvan scenes on the whole river. The splendid woods of Gattonside in the middle distance, and the gently-sloping ridge of hills, covered with yellow corn, and towering against the horizon, constitute a picture which has, indeed, been often painted, but we believe has scarcely been done justice to. The wooded amphitheatre of Peebles is also very beautiful. But the view from Kelso Bridge, where, from the confluence of the Teviot, the noble river expands to a width equal, we should think, to the Thames at Putney, or the Tay at Perth, with the town on the right hand, the woods of Springwood on the left, and the Duke of Roxburgh's noble castle of Floors, surrounded with beautiful foliage, in the distance, is unquestionably the most magnificent.

The beauty of the valleys, it is interesting to note, has in a great measure originated their geological structure. The valley from Melrose, for example, occupies the basin of what was once an ancient lake. This is quite manifest whenever the ground is turned up. From east to west deposits are met with, quite close to the surface, of fresh-water sand-beds, inclosing water-worn boulders. In fact, this valley had at a very recent geological period,—certainly long after the era of the Silurian Rocks, which it traverses,—acted as a great basin or reservoir in the course of the river; and had so existed until, in the ordinary process of lake and river phenomena, it burst the eastern barrier and liberated the pent-up waters. It will at once be seen, on this hypothesis, what a rich and fertile soil the ancient lake-bed would yield to the future vegetation of the river valley.*

The same geological phenomena will account for the peculiar beauty of the Tweedside hills. A little south of Melrose we have one of the most remarkable groups—the Eildon hills, once the Trimontium of the Romans, so called from the peculiarity of their form. Properly speaking, the Eildons are only one hill rising from one base, but divided into three peaks.† The top of the highest summit is 1,364 ft., at above the sea-level, at which point there is a magnificent view. The composition of the rocks of the two northern peaks is a sort of felspar and porphyry. On the south-west descent of the southern hill the opening of a quarry has laid bare a number of perpendicular pentagonal prisms of beautiful flesh-coloured felspar, each about 20 ft. high, as exposed, but probably of far greater height, with remarkably acute and distinct angles. Near this locality are traces of stair or trap, rising from the partly broken bed of the strata, and other evidences of a basaltic character. Sometimes pieces a foot square lie exposed jutting out from the surface of the ground, looking towards Bowdenmoor. No less than sixteen terraces are traceable on the sides of these hills, rising above each other like the steps of a stair. On the summit of the eastern hill there are also unmistakable traces of a Roman encampment.

Keeping this character of an ancient river-basin in view, with its copious deposits of sandstone, and keeping in view the phenomena of the igneous intrusive rocks of the triform Eildon hills, we get some insight into the character of the stone. Hornblende rock, of a quality capable of being polished like marble, occurs in various parts of the valley. Greywacke, which abounds over all the north and west, with a north-easterly dip, is worked as a building material. There is also a species of conglomerate, which is at this moment regularly blasted at Quarry-hill (and an ugly gap it makes in the landscape). But although sandstone of fair quality occurs in the south-east corner of the valley, that which is chiefly used for building purposes is brought from Sprouston, or from Eccles, in Ancrum, on the estate of Sir William Scott. The splendid red sandstone of which Melrose Abbey was built seems to have been obtained from the old quarries in the vicinity of Dryburgh.

But, although so fertile in the possession of materials, it is curious that the Tweed was for the greater part of its history remarkable for its poverty in bridges. Up to a late period, indeed there were only three old bridges within a range of seventy miles: these were built at Peebles, Melrose, and Berwick respectively. But now within the same distance there are at least twelve bridges crossing the river, many of them suspension bridges: a timber bridge at Innerleithen; a good stone bridge at Yair, between Selkirk and Galashiels; a suspension bridge (one of the earliest constructed, we believe) for foot passengers between Melrose and Gattonside; another stone bridge at Drygrange, near the mouth of the Leader. There was a suspension bridge at Dryburgh Abbey (which, we regret to see, has been allowed to fall to pieces, the chains only being now in existence); and another fine suspension bridge still connects Floors Castle and St. James's-green. Last, though not least, there is a magnificent stone bridge at Kelso, designed by Rennie, consisting of five elliptical arches 72 ft. in span, with deep narrow voussoirs, and adorned on the spandrels with Ionic capitals; and there is also a splendid stone bridge across the Tweed at Coldstream. We need not again describe the railway viaducts at Melrose and at Berwick. The latter is one of the most striking and costly viaducts we possess, and was only excelled by that of Plymouth in the difficulties of its construction.

In dry seasons the volume of water in the Tweed is not nearly so great as formerly. In very rainy seasons, too, the subsidence of the water is far more rapid than it used to be.* Agricultural improvements, draining more especially, clear away the surplus water from the land, with amazing rapidity, and the best pools, as the fisherman knows too well, are from this cause most seriously affected. Supposing these georgical changes and improvements to continue, and ultimately to embrace the mountain slopes and high uncultivated districts of the Tweed, and its tributaries, the time will come, we think, when the heads of the weirs or caulds must be lowered at the overshot; or many must go wholly to rest, together with the mills and machinery which are dependent on them. It becomes also more and more apparent every year that the salmon which seek their spawning beds high up the Tweed, cannot repass the mill wears on their return to the sea; and accordingly the fish are compelled to remain too long in the river, to their great deterioration, and unnecessary exposure to the inroads of the most fisherman and the poacher.

The salmon fisheries were for many generations of great value. Of late years, however, these have sadly fallen off, to the extent, it is said by one authority, of nearly two-thirds of its former average produce. Many causes, in addition to those we have mentioned, have been assigned for this. The projection of the pier at Berwick into the *alveus* of the river, the very general use of lime in the agriculture of the hillsides, the increase of rod-fishing, the use of stake-nets by the lower proprietors, and, above all, the poaching and illegal destruction of fish during close time, have each and all been alleged, but have in their turn been severally pronounced by competent authorities to be inadequate. The real fact of the matter appears to be, that the deterioration and destruction of fish,—not confined to salmon alone,—in the Tweed, are due, in our opinion, to precisely similar causes as are at this moment operating in the Thames or the Trent—that is, in the first place, to the diminution, and secondly to the pollution of the river. This, however, is too important a subject to be discussed at the close of an article which is already too long. The same cause may be assigned for reserving our consideration of the value of the Tweed as a source of water-supply, and of its character with regard to public health.

* This statement first appeared, as far as we are aware, in the "New Statistical Account of Scotland," article "Melrose," vol. iii. p. 116. But the observation is probably due to Dr. Hutton or his school. See "The Theory of the Earth," vol. ii., p. 403.

† There is a foolish tradition in the district which says that these summits once formed a single cone, which was severed in three by an infernal agent of Michael Scott, the wizard. *Vide* "The Minstrelsy of the Scottish Border."

* Compare Mr. Geikie's book, cited above, p. 253, as to the geological causes of the change of the river-bed. The Tweed, it appears, has not always pursued an undeviating course. See also Wade's "History of Melrose Abbey," p. 136, *et seq.*, from which we learn that the monastery held a portion of land now divided by the river.

THE METROPOLITAN RAILWAY.

The Underground Railway of London is *sui generis* among the railway systems of the kingdom. Other systems have their termini and their principal intermediate stations; this, when completed, will have neither beginning nor end. Other lines are alternations of cuttings and runs in the open, more or less elevated above the natural level of the surface, occasionally varied by a tunnel; this is a continuous burrow, a succession of covered ways, with troughs of various lengths, at irregular intervals, open to the sky, for light, but more especially for ventilation. On other lines the distance between stations is measured by miles; on this by furlongs and chains. On other lines trains are run by the dozen in a day; on this they are run by the hundred,—250 each way daily. On some lines trains run at intervals of hours; upon this at intervals of about two minutes and a half during the busiest times of the day. With other railways the increased passenger traffic is indicated by per-centage, greater or less; its traffic has trebled in four years: in the half-year ending June 30th, 1863, the number of passengers carried was 4,823,437, in the half-year ending June 30th, 1867, they reached to 11,488,358, with an accelerated increase since then. The receipts of the most prosperous of other lines fall far short of 100*l.* per mile; its receipts exceed 1,000*l.* per mile. The construction and character of an important addition to such a system are worth longer notice than we gave last week.

In speaking of the Metropolitan Railway as to have, when finished, neither beginning nor end, the Metropolitan District Railway is included with it. Although the two companies are, and have always been, separate and distinct as regards financial affairs, they will be, as regards working, and as a system of communication, one concern. An ultimate complete fusion of the two seems one of the likeliest of all future amalgamations of railway companies. The portions of the systems of the Metropolitan and the Metropolitan District Companies which constitute what is known as the inner circle, secured the special approval of the joint committee of Lords and Commons on Metropolitan Railway communication, which took evidence and reported in 1864. The advantages anticipated from the completion of the circuit were,—the distribution of the passenger traffic, arriving by the main lines coming within the metropolis, and also relieving the crowded streets by the absorption of a portion of the omnibus and cab traffic. Notwithstanding the enormous number of passengers carried by the Metropolitan, these advantages have been, as yet, only partially realised, although it is already in direct communication with the Great Western, the Great Northern, and the Midland systems, on the north of the Thames, and with the London, Chatham, and Dover on the south. The communications with the London and North-Western, at Willesden Junction, and with the South-Western, at Clapham Junction, by connexion with the West London, are less direct now than they will be ultimately.

The first portion of the metropolitan line was opened at the beginning of 1863, from Farringdon-road to Bishop's-road. Subsequently the company acquired an extension westwards to Hammersmith; the portion of the line from Farringdon-road to Moorgate-street has been completed and opened; and a line, which forms a junction with the Metropolitan at Baker-street, has been constructed and opened to St. John's-wood. The continuations of the Metropolitan scheme still remaining for execution to complete that company's portion of the inner circle are,—at the East-end, the short but important link between Moorgate-street and Broad-street stations, and thence, by a curve to the south, to Tower-hill, passing under Fenchurch-street station, where it will run into the Metropolitan District Railway. The works between Moorgate-street and Broad-street stations are expected to be completed and the line opened early in next year. The more important portion of the Metropolitan system, the works upon which are now all but finished, is the continuation of the circuit westwards, and round south and east, to return, running into the Metropolitan District, *via* Westminster and the Thames Embankment, to Tower-hill. The Metropolitan and the Metropolitan District lines meet each other in the station at Kensington High-street station; but the Metropolitan overlaps the District to South Kensington station in so far as

continuation of the circuit is concerned. From this point to Tower-hill the works belong to the District Company, but the running will be continued by the trains and rolling stock of the Metropolitan.

It is a strange experience to "foot" such a piece of new line as this;—to have to draw entirely upon memory and imagination, and to be utterly unaided by sight with respect to the character and appearance of the district overhead which we are passing through;—to be in constant wonderment as to whether we are walking under mansions or mews, wide thoroughfares or back courts and alleys, green gardens or dusky coalyards. Our polite conductor, however, Mr. W. Morton, resident engineer on the line, was as communicative upon all points as we could desire. The extension about to be opened commences under Praed-street in a bell mouth, which was constructed when the first portion of the Metropolitan system was made, and is at a point rather less than half way between Edgware-road and Bishop's-road stations. From this junction the road is continued under a covered way, succeeded by a short length of open line within retaining walls to the first of the new stations—the Paddington,—which is situated immediately in front of the Great Western Hotel, the distance being 3 furlongs 6·89. At the point of the fork between the existing line and the extension a round house has been constructed and fitted with levers, and in connexion with them points and repeating signals, to be used for the block system of working. Intermediate signal-boxes are being fitted up between the stations on the new extension throughout. Their effect will be to double the number, and to halve the lengths, of the blocking sections. The additional stations beyond Paddington are at Queen's road, Bayswater, 4 fur. 9·24; Notting-hill Gate, 3 fur. 8·66; Kensington, High-street, 4 fur. 6·98; Gloucester-road, Brompton, 4 fur. 6·28; and Brompton-road, South Kensington, 3 fur. 7·02. The last stage is not yet ready for opening, but the works upon it, and upon the first two stages of the District portion, are being vigorously prosecuted, and in a few months will be so far completed as to admit of opening to Sloane-square, 6 fur. 0·96, and thence to Victoria, 5 fur. 1·10, and Westminster Bridge. The Thames Embankment stops the way eastwards, and financial difficulties may possibly retard the completion of the circuit to Tower-hill, and round to Broad-street. Although they had been made of money, the District Company could not get past Blackfriars now by any possibility, and they have allowed the Embankment to be filled in, in preference to expending capital upon heavy works to lie unproductive for an indefinite time. The only portion of the District work executed to the east of Westminster, is a short length of covered way under the forecourt of Cannon-street Station and Hotel.

The new extension is, as regards the measure of air and of daylight let into it, and especially in the cheery lightness and good looks of the stations, a great improvement upon the original section from Farringdon-road to Bishop's-road. A governing principle in constructing the line appears to have been to prefer the open to covered ways, wherever the property dealt with is of moderate value, and every opportunity appears to have been taken advantage of to lighten the road by open portions. In some districts, such as Pembridge-square, open lengths were totally inadmissible, and covered ways of extraordinary strength have been constructed to sustain the superincumbent weight. In that particular locality the company had to purchase five costly mansions in course of erection. These were underpinned, and now rest upon the roof of the covered way under them, which consists of pairs of strong cast-iron girders under each principal wall. Cross girders are also applied, and the spaces filled in with arches. The work was accomplished without the slightest settlement in any part of the buildings. Numerous other cases of underpinning large buildings were accomplished with equal success; amongst others of a public-house in Cambridge-place, at which business was never interrupted. At Leinster-gardens a curious piece of work presents itself. One tall house in the range had to be taken down, and the flank walls of the houses upon each side of it to be supported. This has been done by four pairs of strong buttresses built against the walls. These are supported by joists of rolled iron between the buttresses, resting in cast-iron sockets; the joists are strengthened by cross iron ties. To prevent disfigurement of the other houses a wall, the same height as the fronts, has been built over the end of the covered way, and ranging with the house fronts. This wall will be finished as a dummy front. The well behind the brickwork is at the back, about 90 ft. deep down to the rails. In one portion of the line, at which an open length was considered desirable, the depth from the overhead surface to the rails is so great as to have necessitated extra strong retaining walls, with double struts, one range above the other. Cast-iron struts have been introduced between the retaining walls wherever the mass behind them has been considered so heavy as to render this precaution against pressure necessary. The retaining walls are nearly uniform throughout, 8 ft. clear between the piers, piers 3 ft. on the face, or 11 ft. from centre to centre. They batten about one in eight, and have a thick backing of concrete. The covered ways vary in section: when there is head-room, an elliptical arch, usually five rings of brick, is thrown; but when there is only 3 ft. 6 in., or less, to construct in, the roof is of cast-iron girders, with transverse jack arches between. In cases of heavy superstructures also, extra strong roofs, up to nine rings of bricks, have to be provided for the covered ways. The engineering difficulties encountered in the construction of such a line as this are numerous and peculiar. A minimum clear space from rail to roof must be had, and must be obtained by passing over a sewer here, and under gas or water mains, or a road near it there. An enormous number of owners and occupiers of property have to be satisfied. Occasionally, though very rarely, the engineer gets what he wants *without* satisfying the claimant. On a part of one of the covered ways sufficient thickness was not left between the face of the wall and the round end of a lumber cellar. The demand made was that the company should purchase the cellar, which would have been perfectly useless to them. While legal proceedings were pending, the work was pushed forward, the end of the cellar was closed up with strong cast-iron plates, which were faced with single brick, and there that matter ended. The line passes *over* the Ranelagh sewer—one of the main sewers of the Metropolitan Drainage system, on the north side; near Sloane-square, on its way eastwards, the line will pass *under* the same sewer. Several instances were pointed out to us of heavy cast-iron plates laid between the girders, upon which water and gas mains are carried across the line, leaving just sufficient head-room. Near Bedford-gardens a tunnel proper occurs, which was driven in the ordinary manner; not worked from the surface: it is about 450 yards long, and about 65 ft. from the rails to the top at the deepest part. The stuff excavated was London clay, overlaid with loose ballast, that had to be worked out with sheet piling.

There is a long curve on the line, as it turns to the south, in the neighbourhood of Notting-hill. The centre of the curve, which is nowhere sharper than a 10-chain radius, is at about the point where the line crosses under the Uxbridge-road. The prevailing gradients are descending westwards and southwards; lengths, with gradients of 1 in 70 and 1 in 75, are the most severe on the whole line. These are now considered easy.

The stations are uniform in general plan, although varying in some particulars. The double station at Kensington High-street, which is to accommodate the Metropolitan and the Metropolitan District lines, is the largest and finest of the series. The centre consists of a spacious and lofty room, 44 ft. by 31 ft., which is to be used as a refreshment-room.

The two booking-offices are across the ends of the building. The booking-offices and station walls and roofs, although from an engineer's rather than an architect's designs, are very light, graceful, and effective structures. They are faced with white perforated bricks from the Halsey brick-fields, with stone dressings; the ordinary work is of the common Kentish stock-brick. The doors and windows have semicircular heads: each of the two sashes in the windows is filled with a single sheet of plate-glass. The entrances to the booking-offices are under iron verandahs, roofed with glass. The roof of the Kensington Station is 81 ft. in span and 418 ft. long. It differs from the other station roofs in having the principals carried down to within about 2 ft. of the platform level; whereas in the other roofs the principals spring from near the level of a string-course not much below the top of the station wall. The string-course indicates generally the surface level on the outside of the station wall; but at the Kensington Station the ground slopes from the top of the wall at one end to nearly the bottom at the other, and the principals are hence carried down, that solid abutments may be obtained. There are twenty principals in the roof with two intermediate rafters, supported by trussed purlins. The form of the roof is elliptical, all the bearing and other parts being of rolled or wrought iron, excepting the corbels, spandrel scrolls, and ornaments, which are of cast-iron. The roofs are covered, in nearly equal proportions, with zinc of No. 14 gauge on boarding, and sheet-glass in three continuous belts. The lower edges of the glazed belt on the crown of the roof are set at about 20 in. above the zinc belt for ventilation. There are also ranges of windows above the string-course available for light and ventilation. Several of the booking-offices are built on and across the line, in some instances upon plate girders, 5 ft. deep, under its principal walls; in other instances, upon the covered ways at the ends of the platforms. All the stations are furnished with galleries across the line for exit and entrance or exchange of platform. The gallery and stair rails and ironwork of the roof are painted in two shades of green, picked out with a sober buff. The stations are fully supplied with closets, urinals, &c., substantially and neatly fitted up, the latter lined with blue and white enamelled tiles, with a patterned border at the top, and with divisions of slate slabs enamelled in white. The station platforms have plank floors, and are of sufficient length to serve six carriages, 40 ft. and 42 ft. long each, with their engine and tender. The stations will be lighted at night by globular lamps suspended from the principals over the platforms on each side of the stations. The gas-pipe by which they are hung works in a ball and socket joint. The ribs of the lamps are of copper, and very light, so that scarcely any shadow will be thrown from them. They are worth about 7*l.* each.

Above 500,000 cubic yards of earthwork have been removed in this length of less than three miles of railway. A considerable portion of the stuff excavated has been utilised in the work. Sand has been taken from it for the mortar, all the ballast for the line has been taken from it, and above 22,000,000 bricks have been made from the clay, tempered with loam and sand in suitable proportions.

The rails are of Bessemer steel, 85 lb., or rather over, to the yard. They are single-headed, and fixed without chairs; the flange is above 6 in. broad, and the rails fixed by ¾ in. bolts, with fangs below the sleepers.

An interesting experiment is in progress near the Gloucester-road station. An arch of wide span, and with a rise of only about a tenth of the span, has been thrown across a part of the District line in its course towards the West London line. The vault is formed entirely of concrete, and is about 12 ft. across between the faces. It is only about 18 in. deep at the crown, and so flat as to give the impression that the tenacity and strength of the material has already borne successfully a crucial test in bearing its own weight without loading, as it has done since the centres were struck. It is expected that this structure will bear a distributed weight of 50 tons or upwards.

Several new streets and roads are in process of construction in the neighbourhood of the line at what will be its terminus for the present. One of these will furnish a short and direct communication between the station at Brompton Old-road and Cromwell-road, in the immediate vicinity of the South Kensington Museum.

The works have been executed according to the plans of Mr. John Fowler, engineer-in-chief, and Mr. T. M. Johnson, the company's engineer, with Mr. W. Morton as resident engineer, by Messrs. Kelk, Waring, & Lucas. They have been about two years and a half in progress.

Vechte.—All who are interested in art-workmanship will hear with regret of the death of Antonia Vechte, the *repousseur*, at the age of sixty-nine. Vechte, a native of France, worked almost to middle age before his talent was duly recognised. He worked in London from 1850 to 1860, and gained increased honour at the Great Exhibition of 1862. His reputation is European.

THE TEMPLE OF AVEBURY.

Architectural history, or, more correctly speaking, the history of civilisation which is indicated or recorded by architecture, may be traced back with considerable distinctness for some two thousand years. The exactitude of modern criticism tends to the substitution of actual knowledge for mere opinion; and, in dealing with the substantial facts of brick and stone, there is less room for the latest, or neo-German stage of criticism (namely, the substitution of the imagination of the writer for the traditions of his contemporaries), than is found in literature. With yearly increasing precision, therefore, we are learning to decipher the architectural records, back to that Augustan age which has so strongly impressed the subsequent course of Western civilisation.

Before the period which converted Rome from brick to marble, and which gives us the first historic glimpse of our own island,—a glimpse precious from its date, although manifestly perverted as to many of its facts,—we are able to take a retrospective view, less detailed indeed than in more recent times, but in which certain salient points are marked with great precision. The unearthed cities of Campania, the temples of Pæstum, the marbles and the ruins of Greece, the *Cloaca Maxima* of the Roman kings, carry back the dated work of the builder to the period when the Canon of Hebrew Scripture was unclosed, and when, in the golden youth of Pericles, Nehemiah was repairing the megalithic walls of Jerusalem. Those same enduring walls carry back the architectural student for more than 2,800 years from the battle of Waterloo, and reflect a yet more remote antiquity. Nor are we without signed architectural work of a period far anterior to that of Solomon; for in the series of cylinders, purse-formed clay tablets, seals, and bricks, impressed with the long-forgotten cuneiform characters that Sir H. Rawlinson is teaching us how to decipher, we are led back from the reign of Nabonedus, the last king of Babylon, through that of Nebuchadnezzar, of Sennacherib, and of their predecessors, to that of Arioch, king of Ellasar, the contemporary of Abraham, of whom we have a memorial, in the shape of a stamped brick, in the British Museum. This king was one of those who made war, "four kings with five," in the vale of Siddim 4,050 years ago.

To say nothing of the distinct and independent record of the wonderful Hindoo architecture, in which the forms and outlines of a wood-building people have been reproduced in stone, and marble has been pierced into lacework, we have a parallel line of historic record in Egypt, which allows us to trace, at irregular but clearly-marked intervals, an architectural and a sculptured record, from the fall of Cleopatra to the Theban tombs of the great Eighteenth Dynasty; under the eighth king of which (not counting the reigns or regencies of the famous queens of the house) the Exodus took place. We see represented on the walls of a tomb of this date the Syrian shepherds at work in the brickfield, and we are enabled to identify the buildings, and to understand the social life of Egypt 3,400 years since, with wonderful exactitude and detail. The erection of the unsculptured walls of the Great Pyramid, according to the patient researches of Brugsch, dates 2,000 years before the Exodus.

Earlier than any dated architectural record,—earlier, artistically (whatever was the case chronologically), than any raised obelisk or sculptured stone, are those Cyclopean remains that are found in certain localities, on the shores of the Mediterranean, and stretching on towards the Persian Gulf, associated, more or less closely, with traditions of a race of giants. Still ruder and more archaic than the megalithic walls of Cyclopean architecture, are those mysterious piles of gigantic stones which are to be traced in more than one line of travel towards the western shores of Europe, from the cradle of the Sanscrit family of speech; and of which some of the most remarkable instances are yet standing in our own islands, and known as cromlechs, or as Druidical stones. In associating these relics of a mighty past with those Druids of whom we form our opinion chiefly from the Commentaries of Cæsar, it is probable, as will be seen from what follows, that we have much under-valued their antiquity.

The general advance of all human art is evinced by the attainment of a higher and more perfect finish, and by the substitution of the results of skill for those of mere strength. We may go further, and trace, in one direction, the steady and marked development of skill as well as of taste; while we find, on the contrary, as we bend our glance back, proofs of the exercise of a strength which exceeds our comprehension. Thus if we contrast the enormous bulk of the unsculptured walls of the Great Pyramid, with the work of the tombs of the eighteenth dynasty of Egypt, we are led to the conclusion that a lapse of 2,000 years at once increased the skill of the Egyptian race, and diminished the impulse of the builders to affect the imagination by mere bulk. In the Cyclopean masonry, again, we can trace a growth of skill, evincing, no doubt, an increase in metallurgic knowledge, and the substitution of the craft of the mason for the labour of the giant. We must repeat the caution that it does not follow that artistic progress is absolutely chronological in its course. The migrations of races may lead to a displacement of architectural records of which we have not yet grasped the law. The public are only now learning the contemporary existence of a tribe in India who yet venerate, or even erect, dolmens and other rude stone memorials. But, making this allowance, it would seem impossible to arrive at any other conclusion than that the rude piling of stones, which we recognize under the term cromlech, marks an earlier stage in human progress than does the erection of even the rudest Cyclopean wall; even as the uprearing of single, massive, unincised stones is more archaic than the raising of wrought and engraved obelisks.

According, therefore, to all the testimony which archæology has yet adduced, the cromlechs and memorial-stones of pre-Julian England represent a period in the artistic development of the human race approaching that of the construction (entirely undated) of the works of Mycene, or to the 5,400 years of antiquity attributable to the Great Pyramid.

Compared with the work usually called Cyclopean, Stonehenge and Avebury will rank in a late period of megalithic work,—when the mason had learned how to cut his material with the accuracy and the finish of the carpenter. On the other hand, great antiquity is denoted by the absence of cement. The British masons were, if not absolutely ignorant of the value of lime cement, at all events so unprepared to depend on its service, that they encountered vast labour in mortise and tenon joints to some of their largest stones. Indeed, the use of enormous blocks, the weight of which was calculated to give that stability which, four thousand or five thousand years ago, Egyptian and Assyrian builders had learned to secure by mortar or by bitumen, was displaced by that of cemented masonry. The stone hewing of the British temples rivals that of Solomon himself; but the masonic skill, the true building science, was far less advanced in the former case. The artistic period of our great circular temples may have been pretty close, speaking only of the character of the work, to that of the Pyramid, in which, although there is the later feature of cement, there is the same use of enormous and curiously-wrought blocks in the more important parts of the structure.

In the centre of the rolling chalk downs of Wiltshire, about fifteen geographical miles, as the crow flies, nearly direct north of Stonehenge, at a spot where a line drawn from Calne to Marlborough intersects a line drawn from Devizes to Swindon, is the little village of Abury, or Avebury. The spot is somewhat inaccessible, according to our present habits of travelling, being seven miles from the nearest railway station, and that only being the terminus of a branch of the loop line to Marlborough. A glance at the map will show that, in roadless times, this must have been one of the most central and retired parts of England; impossible of access from the coast, or by the course of any navigable river; and so hidden by the undulations of the ground, as well, in all probability, as by the depths of a vast forest, as to be the most secret, as well as the most sacred, sanctuary of a primeval faith, and capital of a forgotten dominion. The wide-spread traces of enormous labour point to this spot as the capital of the cromlech-building people.

The position of Avebury forms a remarkable contrast to that of Stonehenge, with which it is intimately connected, no less by the character of the remains than by vicinity of position. The latter named place of worship or of concourse appears to have been selected, unless it also was veiled by forest, rather as a conspicuous than as a concealed situation. With Avebury it is the reverse. The shrunken dimensions of Marlborough Forest no longer approach the village, and the timber that clusters richly around its relics bears no signs of remote antiquity; but the sheltered character of the spot, and the luxuriance with which the indigenous forest trees thrive in the neighbourhood, indicate the former depth and shadow of the sacred grove; and, even in its present denuded state, the traveller must come very close to Avebury before he becomes aware of its claims on his attention.

Leaving the picturesque high street of Marlborough by the Bath road, and passing the quaint red-brick buildings of the college, and its noble chapel, less than two miles brings the traveller to the first station of the cromlech-building people. A grass-clad combe, or valley, known by the name of the Devil's Den, curves round to the north and west, and on this, out of sight of the highway, although at a distance of less than a mile from the road, stands a cromlech of three stones; the upper or horizontal one, of some 12 ft. by 15 ft. in size, being in fair preservation. The cromlech stands alone, in what is, at this moment, a potato-field, but at a little distance the pasture land is covered for a length of more than 600 yards, by a collection of immense fallen stones, filling up the whole of the valley. It must be remarked that all these stones have been brought from a very considerable distance. The geological formation of the country is chalk. The stones are of a fine silicious grit, white and clear when freshly cut, and resembling in their lithological structure the Bramley Fall stone more closely than any other with which we are acquainted. Wherever the quarry from which they were extracted was situated, a question which it is of the highest interest to determine, it must have been one marked by deep beds of solid stone, from which blocks of 18 ft. to 20 ft. square by 3 ft. or 4 ft. thick could have been plentifully hewn.

At about two miles' distance from the wide-spread ruin of the Devil's Den, close by the side of the road, lies another site of similar nature, with the exception that nothing remains erect. The stones are known as the "Grey Wethers," and are even more numerous than at the former spot. A third group, of equal size, lies a little to the north, but it is evident that these and other relics have been unsparingly pilfered, and used as quarries for modern work. Gate-posts, retaining-walls, garden-walls, even houses, over the whole distance from Marlborough to Avebury, have been constructed from the noble blocks which formed the temples of the ancient race; and which, by means now unknown, they brought in such profuse quantity from such considerable distance.

Passing the second stone-spread valley, five large barrows strike the eye, on the summit of a swelling down, up which the road ascends. On reaching this ridge a panoramic view extends over wide and bleak downs, the outlines of which are everywhere dotted by large barrows, some bare, some clothed with trees.

At the village of West Kennet, between five and six miles from Marlborough, the stream turns at right angles, descending from the north, and skirting an irregular basin, the slopes forming the verge of which are considerably lower than the barrow-crowned elevations, which in their turn look down on them. A road to Swindon diverges from the Western, or Bath, road at this village, running parallel to, though out of sight of, the stream, and at little more than half a mile from the village. This road climbs the brow of the inner circuit of the basin, and looks down upon the trees that shadow the village of Avebury.

The village itself is not seen until it is closely approached or actually entered, and the enormous stones which yet stand partially erect in the fields and yards with which the houses are interspersed are concealed by a remarkable earthwork which surrounds the village. This defence consists of an exterior mound and an interior moat or ditch, in a circular form, which has been preserved from destruction only by its great magnitude. The enclosure is some 500 yards in diameter. The line of rampart and moat is about forty-eight yards in width from the inner edge of the ditch to the outer foot of the exterior mound. The height from the summit of the highest parts of the mound to the bottom of the ditch is now from 50 ft. to 60 ft., and, when the whole work was in a perfect state, must have been considerably more. The temple within the enclosure was thus entirely concealed from view. As a defensive structure the earthwork is remarkably defective, from the circumstance that the moat is placed within the rampart, so that the only resistance afforded to assailants who might

attempt to ascend the former must have been that of the weapons of the defenders. The moat is now entirely dry, but from the depth at which the water is found in the village wells, it is probable that it was formerly wet, and supplied from the Kennet. At Chisbury, a lofty hill, ten miles, as the crow flies, from Avebury, exists a similarly moated enclosure. In the latter case, however, there is a rampart *within* the moat, and the natural elevation of the spot enabled the occupants of the central area to command the approach on every side. The outer rampart, at Chisbury, seems to have been chiefly intended to confine the water within the moat, and as this is now wet, although at the summit of the hill, it seems clear that the rampart makers were aware of the method of confining water by the use of clay, or what we now call puddling.

If the military strength of Avebury was diminished by the erection of an external instead of an internal rampart, the sacred character of the spot seems to be denoted by the position of its defenders without the precincts, and separated from the interior by a broad and deep moat. It is difficult on any other theory to account for this remarkable inversion of the ordinary section of a defensive work. No trace of a ditch exterior to the mound is to be found.

The gigantic stones, some of which are from 16 ft. to 18 ft. square, which yet stand and lie within the moated circle of Avebury, are too few and scattered to enable the observer to form any definite conclusion as to the original plan of the temple which they probably formed. Traces may perhaps be detected of an outer and an inner circle. Some antiquaries have thought that the gigantic blocks were originally disposed so as to form two circular temples. Two enormous blocks, which seem at one time to have been wrought slabs perhaps 18 ft. by 20 ft. in size, and a yard in thickness, stand angle-wise and near to one another, as if they had served for the supports of a cell or built shrine.

The weather has furrowed and grooved some of the stones in a manner which, considering the hardness and purity of the grit, denotes the lapse of an enormous period of time since they were erected on their present site. The labour of transport and of erection must have been stupendous. In the uncemented retaining walls which are to be found in several places along the side of the Bath-road, and which are constructed of this durable and beautiful stone, are to be seen the marks of drills, testifying to the use of powder. It appears, however, on investigation, that this powder could not have been employed in the quarry, but was pressed into the service of the makers of the macadamised road, in their destruction of these priceless relics of remote antiquity for the purposes of the most ordinary work.

The magnitude of the Temple of Avebury is not attested merely by the number, or by the size of the gigantic blocks which as yet have defied the economy of modern improvers. At nearly half a mile from the rampart, sixteen enormous blocks, in various states of erectness, obliquity, or overthrow, yet remain to indicate an avenue 72 ft. wide, and composed of blocks or slabs regularly placed in pairs at intervals of 48 ft. Two hundred yards beyond the last of these stones stands another, in the same line, indicating the former prolongation of the avenue towards Avebury; and two others are to be found at about the same distance to the south. The avenue ran north-west and south-east, and would seem to have been originally at least half a mile in length. The arrangement of the rows of sphynxes placed in the approaches to some of the Egyptian temples is recalled by the remains of this noble avenue of gigantic blocks of freestone.

Thus far the stupendous relics of the cromlech-building people may strike the attention of every intelligent observer. There is a point, however, which is less directly apparent, and which possesses extreme interest.

Great earthworks are not rare, either in this vicinity or in other parts of England. We have described the moated hill of Chisbury, in which no stone is to be found. The rampart of Avebury resembles that of Chisbury, although it is both larger in circuit, and far bolder in section. Neither of these can be referred to Roman work, from their circular plan and great size, as well as from the position, and even from the name, of each relic of ancient fortification. At Marlborough is a hill or tumulus of considerable height, and at West Kennet is the remarkable and lofty conical mound called Silbury Hill. These truncated cones, in which art seems to have aided and supplemented nature, are spoken of as the tombs of British chieftains, which perhaps they were. But they differ so far, both in dimensions and in locality (close to the stream), from the numerous barrows that crest the downs, that we can hardly err in regarding them as ancient strongholds, even if they were also places of interment. Such tumuli occur in South Wales, where they are known by the name of Raths, and in some of them, certainly, no marks of sepulture have been discovered.

We have thus in the same valley a series of earth-works and, entirely disconnected with them except in one instance, a series of cromlechs and stone circles. But the most remarkable fact as to Avebury is, that the rampart does not appear to have been centrally or symmetrically disposed with reference to the stones. It is impossible, without a careful survey, to speak with certitude as to the evidence yet preserved as to the original position of the Avebury slabs. One of them, evidently *in situ*, is on the very edge of the ditch, and none of the others can be referred with any distinctness to the line of circumvallation. But the most remarkable point is, that the great avenue from the south, which we have before described, does not lead up to the centre of the circumscribed village, but points so far to the east as altogether to miss the opening in the line of the rampart. We speak with the reserve due to observation made on undulating ground, and in the absence of a minute survey. Still, it is undeniable that the blocks forming the remains of the grand avenue, of which there are a sufficient number, placed at an adequate distance apart, to define with accuracy the direction of the ancient approach, do not point to the centre of the space enclosed by the earthen rampart, or to the entrance through the latter, and do not give the idea of any symmetry, or direct relation of structural arrangement with the mound and moat.

The enlarged sheets of the Ordnance Survey containing Avebury are as yet unpublished. On the Survey on the inch scale ten of the large stones of the avenue are delineated. The single stone which serves to fix with accuracy the true centre line of the row is not laid down. The direction of the avenue, as far as can be ascertained from a map on so small a scale, points to the most eastern of the large stones marked within the circle. It misses altogether the opening in the rampart, and has no perceptible relation of symmetry or unity of design with the moat and bank.

The effect produced on the mind by this series of facts is, a suspicion that a spot once famous, and probably while still famous, for its stone circular buildings, was fortified by the earth-building people, who raised Chisbury, Silbury, Marlborough, and other raths or tumuli; and that this was done at a time when the temple had been already so far damaged or decayed that it was not thought necessary to preserve the line of the avenue of approach. There can be no doubt that the delineation of the ramparts of Avebury is as independent of the course of the megalithic avenue to the temple or circle as is the setting out of the modern macadamised roads that now pierce the ramparts. We have the marks of three successive series of workmen, and a question is possible whether not only the labour, but the date, of the rampart builders may not be as distinct from that of the stone transporters, as the work of Telford, or Macadam, or the modern road-maker whoever he was, is from either. It is impossible that the stone builders should have been later than the rampart builders, as in that case their work, even if not symmetrically planned, would have been so disposed as either to accord with the less laborious construction, or else to modify and control it. We find, therefore, evidence of the possible interposition of the labour of a great earth-working race, antecedent to the Roman invasion,—a race of whom we may trace the exertions from Wiltshire to Pembrokeshire, as well as in other parts of the country,—between the Saxon settlers, who were not, as is notorious, a fortifying people, and the builders of cromlechs and transporters of megalithic blocks. To how remote an antiquity must the labour of the latter people be referred?

The impression produced on the imagination by a visit to this remarkable spot is not one lightly to be thrown aside. We are on the ancient holy ground of Britain—holy from an antiquity which we have as yet no means of determining. At how distant a period we must fix the era of the giant stone-pilers,—giants in strength and in industry whatever was their actual stature,—we have no clear indication as yet forthcoming. One limit of time may perhaps be inferred. The hewers and transporters of the Avebury blocks must have been provided with metal implements. It is certain that some of the largest stones at Stonehenge were wrought. It is also certain that such blocks could not have been quarried without the use of metal wedges and metal picks or axes. The Wiltshire temples, therefore, are not of the stone age, but come down to the limit of the bronze period. On the other hand, we can find no trace of sculpture or incision on the stones. We have not, it is true, as in Egypt, an intermediate period of sculptured work intervening between our unwritten monuments and modern times; but we have a sign of what, in other parts of Europe, denotes immense antiquity. We can connect the cromlech-builders with a very early immigration from Asia. We recall the tradition of times when men "journeyed from the East," and when the use of bricks, which we can trace back without a doubt for four thousand years, was described as a substitute for stone. We have here enough, and more than enough, to suggest the extreme and venerable antiquity of these relics, which we have been accustomed to term Druidical; and we have pleasure in calling attention to the light which may be gathered from a yet more minute investigation of the relics of Avebury, or to the times when "there were giants upon the earth."

THE SOCIAL SCIENCE ASSOCIATION IN BIRMINGHAM.

Careful arrangements have been made, many good papers have been prepared, and there is every reason to expect a successful congress. Amongst the special questions set down for discussion are, under the head of—

Education,

1. Is it expedient to make primary education compulsory; and if so, on what conditions?

2. In what form and by what means can instruction in science and art be provided, so as to promote the improvement of our manufactures?

In the *Health* department,—

1. Can the public hospitals and dispensaries of this country be so administered as to conduce more to the welfare of the community?

2. What ought to be the functions and authority of medical officers of health?

3. What is the relation of the water-supply in large towns to the health of the inhabitants?

And in the *Economy and Trade* department,—

1. In what manner can arbitration and conciliation be best applied in the settlement of disputes between employers and employed?

2. What are the social results of the employment of girls and women in manufactories and workshops?

A prize of 25*l.* was offered by Mr. W. R. Lloyd for the essay containing the best and most feasible plan for the temporary employment of operatives and workmen in casual distress. The essay to be read at the congress. Nearly eighty essays were sent in, and from them the council have awarded the premium to Mr. Arthur Arnold, barrister-at-law.

On Wednesday evening the opening address was delivered by the president, the Earl of Carnarvon. In the course of it the president said:—

"Schemes of all kinds for an effective metropolitan water supply will next session come before us;—the storage of the Thames; the conveyance of the waters of the Welsh mountains; the sources of the Severn; the abundant but by no means inexhaustible resources of our great North-country lakes; and lastly, the as yet unknown recommendations of a Royal Commission that has now sat for some time past, and whose report is anxiously expected. Without venturing to anticipate, on such a point, the verdict of Parliament, I think there are some considerations that may be here briefly noted.

1. Though London, from its vast population and gigantic interests, has a special importance of its own, it is only one of many towns that suffer from a deficient water-supply; and I doubt whether the great manufacturing towns of the North would consent that London, great as she is in her population, her interests, and her

necessities, should intercept and appropriate that supply which they look upon as their own.

2. The relative merits of those two rival systems, distinguished by engineers as the intermittent and the constant supply, must be brought to a decision. Whilst 150 great provincial towns enjoy the benefits of a constant supply, the capital of England is dependent upon an intermittent provision. I hope that we shall, in the discussions of the week, hear it fairly elicited by fact and argument, whether or no there is, as is alleged, a serious waste of water under the constant system; and, if so, whether such a waste can be restrained by reasonable checks and supervision.

3. The question of a proper water supply is intimately connected with the purification of our rivers, and the restoration of their waters to all the purposes of domestic economy.

4. Hardly less important are the liberation and employment in the service of agriculture of all that matter which, whilst present in our rivers, poisons their waters, but which if once extracted would make the poorest soil rich.

Amidst the many questions which crowd upon the attention of such an audience as this, the consideration of how and whence a water-supply may be best obtained may seem humble and prosaic; but there is none which more closely affects the comfort and health and lives of men in our great towns. It is not too much to say that a good water-supply is a necessary condition to high civilization, which, if she too often exacts the sacrifice of many lives in the requirements of modern society, whether necessary or unnecessary, in the practice of unwholesome trades, in the crowded society of great towns, in the physical and mental over-work to which all classes are subject and which engenders disease and shortens existence, has at least this compensating merit, that whilst she consumes she also rates human life more highly, and proclaims in all her works that there is nothing so humble or so mean that science will not take account of it and true statesmanship ponder it, in order to add one week, or day, or hour to the average of life of the millions who are labouring with, and amidst, and around us.

But cleanliness and sanitary precautions, though powerful agents to morality, are not all-powerful; and our artificially organised society is upheld and balanced by many provisions and safeguards. So long as human nature remains the same, the question that you propound for discussion, 'What are the principal causes of crime,' will always have to be asked, though it must receive different answers under different circumstances of national existence. But, whatever our wish and policy, one answer, at any rate, in an old and rich and populous country, will, I am afraid, be that the depraved and criminal classes, though they may be reduced in number, must always exist. That they can, indeed, be reduced, and considerably, must be the hope of the moralist, the statesman, and the Christian; or otherwise the course of legislation would be even more thankless and desponding than it sometimes is. But you proceed to the further question, whether 'Reformatory treatment should be extended to adults?' In a certain sense I answer, yes. Penal discipline may be, and ought to be, up to a certain point reformatory; but the reformation of the offender is not the only consideration: his punishment and the security of society are at least equally important. But the action of private individuals may usefully intervene where the State is powerless, and voluntary associations like the 'Sociétés de Patronage' in France, and 'The Discharged Prisoners' Aid Society,' which are happily now common in England, may largely influence towards an amendment of life. Beyond this, I doubt whether the State can safely go, and mainly for these reasons:—

1. That our reformatory system seems to me chiefly applicable in its principles to the young.

2. That the law must presuppose a certain malice and deliberation in men of mature years, which it is willing, by a humane fiction, to ignore in children.

3. That with older men the confirmed habits of a life-time rarely admit of modification, still more rarely of absolute change. I personally have long entertained and expressed my opinion that repeated re-convictions, even for minor offences, ought to be treated with far greater severity than is now the case; and that for the sake of the offender, of society, and of the economical administration of the law, the withdrawal for any lengthened periods of the criminal from his companions and the opportunities of crime, would be both the most effective and the most humane treatment.

* * * * *

Finally, I cannot, here in Birmingham, the centre of such great manufacturing and artisan life, pass by, without one word of recognition, the increasingly serious question of what is termed Technical Education.

I do not speak now of the technical education which the architect, the civil engineer, the merchant, the chemical manufacturer may require. Technical education for such classes as these has a very wide sense, and means instruction in mechanics, mathematics, physics, chemistry; and in this sense it is certain that the educational appliances at their command, and the special courses of study necessary for their training are much below their ordinary wants. I am rather looking to the technical education which can practically and advantageously be given to artisans. We are sometimes, indeed, challenged to define the meaning of this education. It would not be difficult to do so, but it can hardly be necessary in Birmingham, where I observe, by a recent Parliamentary return, that a school of art has been established since 1842, in which, during the past year, more than 1,000 pupils were under instruction. Let me only say, in passing, that if there is any one branch of such instruction more valuable than another to the artisan it is the drawing class. But the real defence and justification of technical instruction rests upon broader ground, —upon the necessities of that wide industrial competition with the other nations of the civilized world in which we are engaged. That other nations feel anxiety on the subject, that they are issuing commissions of inquiry, and are taking measures for the foundation of schools and institutes for securing a better technical education, is no evidence of our superiority—no argument for our acquiescence in the existing state of things. For my own part, I believe that that great race of international industry and skill is too close and severe to justify us in throwing away any chance that we can command; and though I have every confidence in English qualities, I doubt if our natural and uncultivated strength lies in those specialities of taste which have become necessary for many artistic productions. To the Englishman much has been given—commerce by land and sea, colonization, the government of men; to the inhabitants of sunnier climates have been granted the instinct of form and colour, and that indefinable and almost nameless appreciation of what is beautiful, which we call taste. But, though we have it not by nature we may obtain some of it at least by education, and, inasmuch as taste is no longer the mere ornament of a cultivated and leisurely life, but has become an essential condition in the commercial existence of the nation, it is our duty somehow to secure it. I will only in conclusion say of all technical education—whether of the higher grades of professional life, or of those lower paths with which the manual labour of the individual artisan is concerned—that its basis must be laid in sound principles of elementary instruction; and that the later teaching is dependent upon the earlier.

I dare not enter here upon the question of State interference. I can only say that, within certain limits to be carefully defined, the State may, I think, afford aid and facilities for such a culture as I have indicated. At the same time, the principles laid down by a recent French commission, that the pupils should be mainly out-of-door pupils, that payment should be the fundamental rule, gratuitous admission wholly or partially the exception, and that the course of the instruction should be for not less than two years, seem to me substantially sound and right principles.

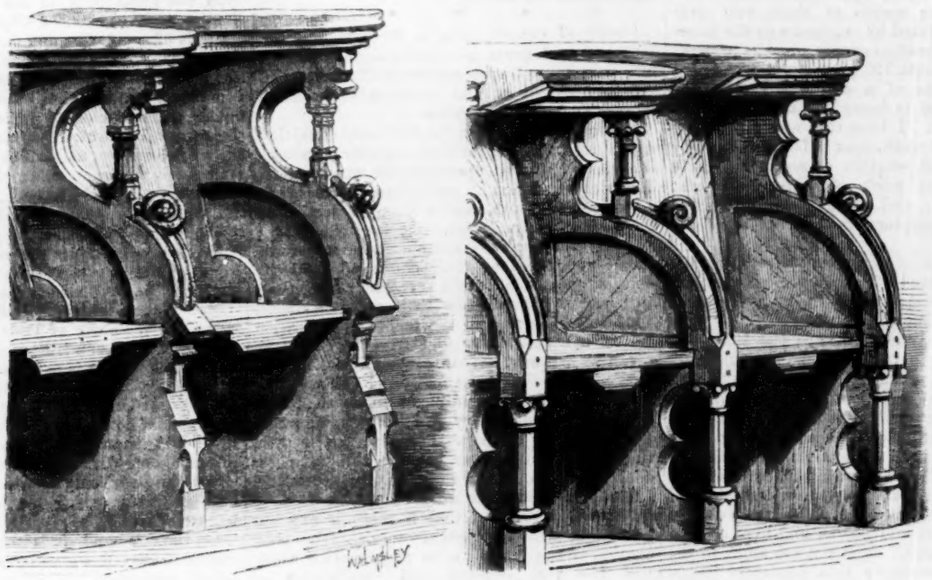
During the last year, we have all read the remarkable evidence published by a Royal Commission, appointed at the instance of working men, to inquire into the operation of that new and important phenomenon of modern civilization, called trades unions. That evidence has revealed the existence of a painfully unsatisfactory condition of things in some particular unions. It has exhibited a system of regulations at variance with all sound principles of trade, and, in some cases as oppressive to the ablest, as they seem unduly favourable to the least skilful, artisans; it has occasionally shown a lawless interference with employers, far in excess of the limits of that legitimate competition, which, though sometimes, perhaps, injurious to both masters and men, is yet strictly within the right of the latter; it has revealed the loss inflicted upon the great body of the nation,—the purchasers and consumers,—by the unfortunate discords of employers and employed, and by the injury done to the powers of industrial production; and, lastly, it has brought to light an amount of crime and outrage in particular unions, on the part of individual members of their executive, which has amazed and terrified the whole country, and which every right-feeling man, be he workman or employer, will not hesitate utterly to condemn.

But, whilst yielding to none in our abhorrence of the lawless and detestable crimes which have been committed under the sanction and in the supposed interests of certain unions, I sincerely hope that we shall not confound the existence of trades' unions with the crimes of which some individual members of their bodies have been guilty. *Abusus non tollit usum;* and if legislation on the subject is to be sound, the legislator must recognise the fact of the existence of such societies, and must do justice to what is fairly to be urged on both sides of this delicate question. I will endeavour to state some, at least, of the principal considerations which appear to me to affect the question, and which we may properly bear in mind during our discussions of this week.

On the one hand, it is untrue to deny to the trades' union all advantages and merits. As a benefit society it has an unquestionable value, and as an association for the protection of certain classes of workmen, against the possibility of undue pressure in particular circumstances, and at particular periods, by the preponderating influence of capital, it may also be beneficial. Wages, indeed, are generally defined as the working-man's share of the common product of capital and labour, and their amount must doubtless be regulated by the general law of demand and supply. This is a law deeply laid in the nature of things, against which it is worse than idle to contend. It is true not only in abstract theory, but in practice, if only a sufficient length of time be allowed in which it may work out its conclusions; but as a matter of fact the labourer has in former years been frequently too ignorant of the value of his labour, or too much at a disadvantage in his dealings with the capitalist, from the difficulty and expense of transferring himself from one market to another and from other causes, to enable him to make his terms. I am, therefore, ready to recognise in the union a protection to the labourer and an agency by which he may secure reasonable conditions in what is and must be a bargain between him and his employer. Nay, more, I can recognise, in the idea of the union, principles, however imperfectly developed, of mutual help and brotherhood, and an organisation which might educate workmen indirectly to those habits and that knowledge of business which I believe it is equally for the interest of his employer and for his own that he should possess.

On the other hand, we must not allow any sophistry to blind us to the anomaly of combining the functions of a benefit society with those of an association for the enhancement of wages by means of strikes and such other expedients. It is an unnatural union, prejudicial perhaps to the association itself and to society at large, an *anceps usus*, a two-edged purpose, as it has been well termed, to which the funds of the body are applied. They are raised for peace, but they are applied to war."

"Fortunately, we need not look to arbitration alone for a solution of that labour question which seems sometimes so perplexing a problem in our present phase of modern commercial life. I have great faith in the sister principle of co-operation, if fairly and prudently applied, by which I mean both the union of workmen amongst themselves primarily and principally for the sale and purchase of articles of consumption, and the union of workmen and capitalists for the purpose of industrial partnerships. An instance of the first kind of co-operation is to be found in Messrs. Briggs's colliery, where we have seen, as its results, an improvement in the workmen's condition, increased profits to employers and employed, harmony between the two parties, and a complete absence of strikes. We have an illustration of the second form of co-operative enterprise in the well-known history of the Rochdale Pioneers, an enterprise leading from small beginnings to almost gigantic results. Co-operation is, as yet, I believe, in its infancy; and yet nowhere but in England have we the same prospect of success, because no-



STALLS AT WÜRZBURG, BAVARIA.

where but in England has the enterprise been launched upon such sound principles. In Germany co-operation has mainly taken the form of societies of credit, and is, if I rightly understand the case, too much trammelled by State interference and protection. In France some of the associations have been formed on unscientific principles, some have been mixed up with the theories of political dreamers; whilst of those which have been successful the majority have assumed the character of societies for the purpose of production. In America, agitated as she already is by trade controversies, I believe co-operation to have made but little progress. In England alone it has had its origin, in what is probably the safest and best foundation, a society for the purchase and sale of stores and provisions and of articles of consumption, capable of expanding as time and circumstances may warrant into associations for the purpose of production, as in France, or of credit, as in Germany. In England, co-operation has stood free from State interference on the one hand, and from demagogueism on the other. It has, in fact, reflected some of the best of our English qualities,—good sense, and the practical adaptation of available means to the ends desired and the necessities of the time; it is accepted by most reasonable men of all opinions; it is at variance with no principle of political economy, no instinct of human sympathy; and it promises, I think, before long, to give to the working man many of those comforts and luxuries which have hitherto been only within reach of a far wealthier class. Whatever be our point of view, one may cordially wish it well, and accept it as one, at least, of the means granted us towards a solution of a most difficult problem."

On Thursday and Friday addresses were delivered in different departments, and papers were read and discussed. On Friday evening a working men's meeting was to be held. On Saturday, Lord Lyttelton, president of the educational department, will deliver an address, in the Friends' Meeting-house; and at eleven the departments will meet in their respective rooms to read and discuss "voluntary" papers. The sections will this day rise early, probably about two o'clock. Time will be allowed for lunch, and then a special train will convey members and others to Dudley, where they will be met at the station by Mr. Frederick Smith, who will conduct them through the caverns and the castle. The Earl of Dudley has been kind enough to order the caverns to be illuminated. The train will meet the party near the place where they come out of the castle, and it is expected that it will be able to arrive in Birmingham early in the evening.

STALLS IN CATHEDRAL AND NEW MÜNSTER CHURCH, WÜRZBURG.

We give sketches of two sets of stalls at Würzburg, in Bavaria. Those in the New Münster church are thirteenth-century work, and those in the cathedral fifteenth century. The latter are in the south aisle of the nave. They were removed from their original position in the choir to make way for the Roccoco abominations which at present disfigure that portion of the cathedral.

FROM MELBOURNE.

Among buildings recently commenced, and of large proportions, with architectural features, is a warehouse now in course of construction on the north side of Flinders-lane, near Swanston-street. The style of architecture is Romanesque. The windows throughout are to be thrown into groups, and those on the ground-floor will be segmental headed. The building has a frontage of 48 ft. to Flinders-lane by a depth of 157 ft. It will be 78 ft. high, and will consist of six stories, including the basement. The several floors will be supported by ornamental iron columns, and the whole surmounted by a bold cornice with brackets carrying a pierced parapet. The contract price is 12,817*l.* 10*s.* Messrs. Reed & Barnes are the architects, and Messrs. Wood & Ireland the contractors.

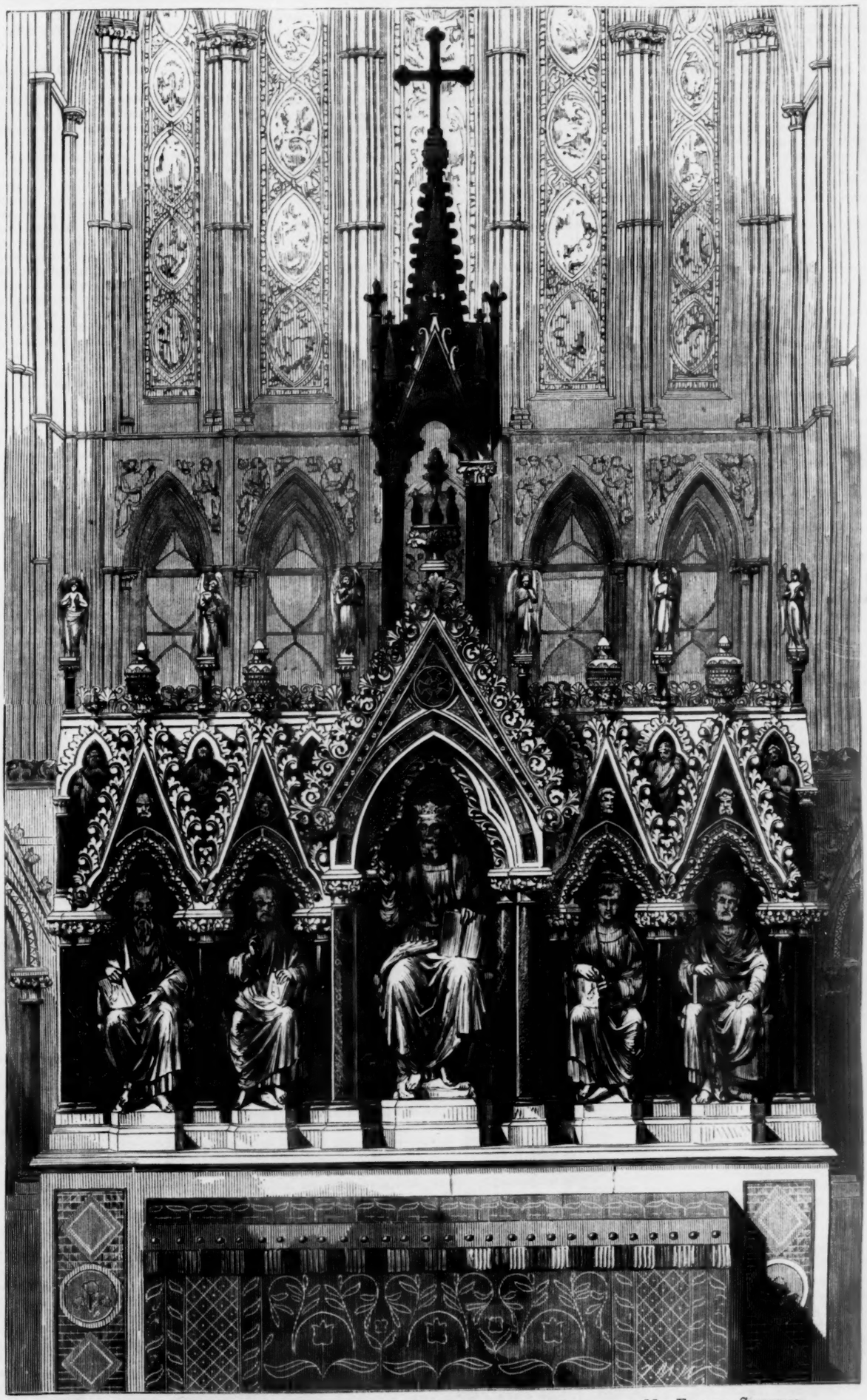
The design for the new bank intended to be erected in Collins-street East, by the National Bank of Australasia, is that prepared by Mr. Lloyd Tayler, architect, and was selected in competition from among upwards of thirty other designs. The style is Palladian. The author appears to have aimed at producing a massive effect, avoiding as much as possible the use of minute mouldings and sculptured details, which, executed in the best freestone at command, would be the first parts of the edifice to suffer from the effects of time and exposure. The façade has a base of bluestone, above which it is constructed entirely of freestone. From the base rise coupled columns, and an entablature of the enriched Doric order. A balustrade separates this from the upper order, which is Corinthian. There are four floors altogether; the ground-floor rooms being 22 ft. high; the next floor, or "mezzanine," 10 ft. high; the first floor, 15 ft. high; and the topmost floor, 11 ft. high. The architect has received instructions to make the whole mezzanine fire-proof for the documents to be deposited there. The plan of the bank is a modification of all those at present erected in Melbourne. The entrance from Collins-street does not open immediately into the banking-room, as in the Bank of New South Wales, nor does it lead into a long passage with suites of rooms on either side, as in the Bank of Victoria and the London Chartered Bank, but through a circular vestibule, 20 ft. in diameter, surrounded by detached columns with niches between, leaving only one room on each side before reaching the banking-room. The banking-room is rectangular in plan, and measures 62 ft. by 53 ft. It is 32 ft. high to the springing of the dome. The dome is divided into enriched compartments, with a circular ceiling-light in each. The ceiling-lights are lighted from external skylights, so that the heating effect of the sun's direct rays is avoided. The dome springs from eight Corinthian columns, which are all placed behind the different enclosures for the clerks, so that they neither obstruct them nor the public in the transaction of their business. Two premiums, each of one hundred guineas, were offered by the Bank for the best and second best design.

REREDOS, WORCESTER CATHEDRAL.

A handsome reredos has been set up in Worcester Cathedral. It is scarcely finished, the steps not being laid yet. A screen connects it with the sides of the chancel. The materials of which the whole is composed are rich. The general structure is of varied alabaster. The columns are of verde antique, sanguine red, and Cornish spars. Plates of marble and mosaic are introduced. The jewels are of lapis lazuli, malachite, and Derbyshire spars.

The reredos and screen present a series of canopied arches. The five centre bays contain statues of Our Saviour and the four Evangelists, all seated, two on either side of the Saviour. The columns are adorned with carved clustered caps and bases. The whole is supported by a dado enriched with diapered work and jewels in rosso-antico, and rich spars.

The steps to the altar-table will be of marble mosaic. An elaborately carved cresting runs along the entire length of the screen and reredos. We should point out that the centre bay of the reredos is loftier than the rest, and above this rises a crocketed canopy terminated by a slender cross. Six figures of angels, upon dwarf columns, assist in enriching the front, and breaking the line of cresting. They are placed one at each end and at the intersections or springing of the canopies. There is a head under the apex of each canopy. The work has been executed, from the designs of Professor G. G. Scott, by Mr. Farmer; Mr. W. Terry having superintended it through the workshops.



REREDOS, WORCESTER CATHEDRAL.—Professor G. G. Scott, Architect; Mr. Farmer, Sculptor.

THE SANITARY CONDITION OF GUILDFORD.

Fever at Guildford has become a serious matter. There have now been about 600 cases, and forty deaths, in a population of about 10,000 inhabitants. Since our last notice of the case, the water has been analysed both by Dr. Letheby and Dr. Hassall. These gentlemen seem to differ in their result, and the local board have resolved that Dr. Hassall should make a second analysis. Dr. Letheby states that there are unmistakable evidences of pollution from surface drainage; and his opinion is that though at present the water is not unfit for human consumption, it may at any moment become so. The chief constable of Surrey writes to the *Times* to state that it is of no use the Mayor writing to show how healthy Guildford has been in past years while fever rages as it now does, and urges that steps should be taken to purify the town. The medical gentlemen practising in the town, to the number of five, have waited on the local board to make a combined representation of the increasing spread of scarlet fever, and the urgent necessity that exists for the provision of a fever-house for the reception of new cases, and also a house where clothes, bedding, &c., may be disinfected. Mr. R. Eager, surgeon, who introduced the deputation, stated that there had then been nearly 600 cases of fever and thirty-seven deaths, and that the malady was still spreading. The board resolved to take immediate steps to provide a fever-disinfecting house.

LEGENDS IN STONE.

From the earliest times man has availed himself of the endurance of masonry to write upon it facts which he wished to perpetuate. The wandering Israelites, we know, as they neared the land flowing with milk and honey, were commanded to write the words of the Lawgiver upon the door-posts of their houses and upon their gates; and this indication of the capabilities of structures to bear witness, and at the same time to remind and record, has been accepted in many countries during the progression of civilization. Both Moses and Joshua, we are told, wrote the law upon stones; and it was upon the wall of the palace of Belshazzar that the wondrous writing appeared which betold that monarch's fate. The remains of Assyrian buildings uncovered in our own times show us that inscriptions were sometimes used as a decorative feature. The ruins of ancient Egypt and of ancient Rome tell us of the same practice in those lands. The eyes of those who entered a Roman dwelling were arrested by an inscription, and those who departed from a building were bidden farewell by another. Every temple, every piece of architecture in fine, was enriched by inscriptions, and we find the deserted quarries the Romans used also lettered to tell their history. And coming northward, still in old times, we find runes treated at once as an ornament and a record, in a border-like arrangement round the edge of memorial stones. This feeling for inscribing upon stone has never left us, though there may have been intervals when it has been set aside. In the Middle Ages it took various forms. We know not whether the Saxon "unlocked his word-hoard" to grace his folkstead; nor whether the Norman attempted to enrich his "earth-house" by this means. When learning was still the gift of the few, the noble placed his heraldic device over his portal, or a series of shields denoting his lineage in bands around his towers; for in those days these would have been more easily deciphered than letters. The ecclesiastic, again, placed the device of a generous donor to the church on some conspicuous place about it, to tell of his munificence. But as the darkness of ignorance rolled away veritable inscriptions took the place of these pictorial substitutes. The lintels of doorways, panels set in the front of houses for the purpose, labels, bands, were inscribed with short sentences, generally of a religious fervour. Thus, over an inner doorway of the entrance into the hermitage hewn out of the rock that rises out of the green shady bank of the river Coquet, in which the unhappy hermit of Warkworth used to dwell, there is a black-letter inscription which seems to take the place of the voice of salutation. It is in Latin:—*Fuerunt mihi lacrymæ meæ panes die ac nocte*,—"My tears have been my meat day and night." Have we not here the compressed history of the sorrows of a life expressed in this passage from the Psalms?

In the Elizabethan era the custom of inscribing upon the fronts of houses distichs, quotations from Scripture, memoranda of various sorts, though generally relating to the ownership or date of the building, was quite in vogue in England. On an old house at Tarporley, in Cheshire, the two following curious distichs, accompanied with the crest and initials of Ralph Done, four other crests, and the coat of Arderne, were inscribed at this period,—

"Ralphe Done Esquyer, the Lorde of thys place
Was an eade to this buldyng in every cace
Jhon Winter 1586."

"Fenys quoth Jhon Newson hath kept hys promes just
In buldyng of this house in Awgust.
Anno 1585."

Over the principal doorway of Dutton Hall, in the same county, may be read, "Sir Peyrs Dutton Knight Lorde of Dutton, and my lady Dame Julian his wife, made this hall and buylding, in the yere of oure Lord God a MCCCCCXIII., who thanketh God of all." And over the great bow-window of Little Moreton Hall, still in the same county, runs the following inscription, carved in the woodwork:—"God is al in al thing.—This windows where made by William Moreton in the yeare of our Lorde MDLIX. Rychard Dale Carpēder made this window by the grac' of God." The pleasant cider county has several examples on the old gabled houses that nestle among the orchards. In Tiverton there is an Elizabethan almshouse, very quaint and precious, with an open gallery in front of it, that has this inscription upon it, if the hand of the despoiler has not erased it:—

"John Waldron, merchant and Richoard his wife
Builded this house in tyme of their lyfe
At such tyme as the walls wer fourtyne foote hye
He deparded this worlde, even the eightynthe of Julye
A.D. 1579."

And in the parish of Walborough, over the door of the hospital founded by Lady Reynalls, in the days of Charles I., for the widows of clergymen, about half a century after this, it is written,—

"The widowes house 1638.
Is't strange a prophet's widowe poore should be
If strange, then is the Scripture strange to thee."

The writing over the doorway of the house in Rochester frequented by the famous "Seven Poor Travellers" will doubtless occur to many of our readers. There is another pithy inscription on the masonry of a house, far away from the smiling hop county, viz., in Alnwick. It is over the doorway of a long, low, [two-storied house, and says,—

"That which your Father
old hath purchased and Left
You to possess do You dearly
Hold to shew his Worthiness.
M. W. 1714."

Sometimes we meet with a repetition of a favourite inscription. "God's Providence is my inheritance" is one chosen by more than one ancient charitable institution. How modest, reliant, and becoming such sweet-savoured sentences appear compared with the self-asserting vaunts with which churchwardens and other public officers have, in later days, defaced structures to which additions and repairs have been made during their tenure in office!

Inscriptions of a similar class are frequently found in the interior of houses. In the picturesque manor-house at Ockholt the motto of the Norreys occurs over and over again,—"Feythfully serve." The mantelpieces are often made the record of the name of the person who built the house, or his coat of arms and the date. In the old parsonage-house at Meppenshall, Bedfordshire, now demolished, there was a curious inscription. The gallant old place, surrounded on all sides by a moat, stood on the confines of the two counties of Bedfordshire and Hertfordshire, and the writing in question, which was carved on a beam in the dining-parlour, bore reference to this circumstance:—

"If you wish to go into Hertfordshire,
Pitch a little nearer the fire."

The cornices of rooms were often inscribed with legends. In an ancient room preserved out of the ruins of Crendon Abbey, Buckinghamshire, the cornice was inscribed, with the Stafford knot, the words, "En lui plaisance." Legends were also sometimes placed over the windows, as in the vicarage-house at Colyton, built by Thomas Brerewood, vicar, in 1529, where might be read, "Peditatis totum, meditatio totum."

The walls and ceilings of Leckenfield and Wressel were decorated with mottoes.

It is not surprising that this hoary old-world lettering should have a charm for most minds imbued with a love of antiquity. Sir Walter Scott introduced it as a feature of some of the mansions he describes. Waverley, we call to mind, found "Beware the Bar" frequently repeated upon the bartizans and turrets of the Baron of Bradwardine's manor-house of Tully-Veolan; and the Quaker's pleasant parlour, known to Red Gauntlet, bore upon its chimney front the wise bidding to all who entered to "Trust in God." The great artist knew the mention of these writings would bring a swifter and more vivid realization to his listener's mind than any other word-painting could give.

In modern times crosses and other masonry on the sites of ancient heroic actions have frequently been inscribed with notices of the deeds that have been enacted near them in past centuries. Thus a clergyman has caused to be engraved upon a stone, near the Lady Chapel at Bothal, two dozen lines of the old poem that relates the death of Sir Bertram, beginning,—

"Thei schot hym downe on ye Elsdon-rigg,
Wher stands ye headless crosse,
Thei left hym swomen in hys bloude
In ye cold moor and mosse."

We occasionally meet with inscriptions on the exterior of churches as well as in the interior. The principal fronts of the rich old abbeys were sometimes, too, thus embellished; and less important parts, such as the towers of the entrance-gates were, perhaps, still more frequently so treated. On the entrance-tower of Ford Abbey, Devonshire, below the battlement, runs a Latin inscription, "*An° Dni millesimo quingesimo vic m° octa° A Dno factum est Thoma Chard Abb.*" This Thomas Chard, who rebuilt much of the fabric, was the last abbot. The ruined Hartland Abbey once possessed a Latin inscription which ran thus: "*Istud: quadratum: claustrum: ... ci edificatum: marmoreo: lapide: perfect: sumptibus: ac: annis A ... Abbatis: et: arte: Johis: Exonie: sit: ei: gr:*." But this has disappeared. In the Umberleigh aisle of Asherington Church, Devonshire, we read,—

"God save the church, our Queen Elizabeth, and realme
And grant us peace and truth in Christ. Amen."

And in Tiverton Church, in the same county, on a frieze on a chapel built by a rich merchant benefactor of the town, and elaborately decorated with the arms of the great companies of which he was free, his mercantile mark, anchors, woolpacks, waves, ships, and boats, probably to denote the means by which he made his fortune, is written,—

"Have grace, ye men, and ever pray
For the souls of John and Jone Greenwaye."

This approaches to a memorial character of which there are too many examples to permit of them being incorporated with the present selections; though it is probable it may have formed part of the original design, as a monument inlaid with brass indicates the tombs of these worthies. On the impost mouldings of one of the arches of the tower of Sunninghill Church, Berkshire, is an inscription read thus: "*Undecimo Kalendarum Martii obiit Liomgus Presbiter*," which, however, we include on account of the peculiarity of its position. In the chancel of Coryton Church it is written,—

"This was a grateful priest: his wealth tho small,
He to his patron gave, who gave him all."

Around the base of Launceston Church, Cornwall, is a range of shields, on each of which is inscribed a letter, which, if commenced to be read from the south side, forms the following legend:—"*Ave Maria gracie plena, Dominus tecum sponsas, Amat sponsam Maria, Optimam partem elegit, O quam terribilis ac metuendus est locus iste, vere aliud non est hic, nisi domus Dei et porta celi.*" The doorway of Dinton Church has another curious Latin inscription. It is in Roman capitals:—

"PREMIAPROMERITSSIQSDESPETHABENDA.
AVDIATHICPRCEPTASIBIQVESITRETINSNDA."

The same county can show us another example. Under the east window, on the exterior of the chancel of the parish church of North Crawley, built by Peter de Guildford, rector, who died in 1321, runs,—

"Petrus cancellum tibi dat Firmine novellum,
Ut cum laueris Deo, Petri memoreris."

The font in Ancroft Church, Northumberland, we may quote as a sample of inscriptions of a post-Reformation character. It says, "God blis this church. R. M. W. Anno Dom. 1670."

Upon a beam of the roof of the wayside-chapel on Wakefield Bridge there is now carved "*Verbum caro factum est. Gloria in excelsis Deo.*"

Melrose Abbey has several curious inscriptions. In a churchyard, on a tombstone, may be read the following vigorous lines, which, with slight variation, have, within the last few years, been inscribed on a panel and inserted on the north side of the ancient Edwardian pele tower, incorporated with the vicarage-house at Shilbotell, Northumberland:—

"The earth goeth — The earth builds
On the earth — On the earth
Glistring like gold — Castles and towers
The earth goes — The earth says
To the earth — To the earth
Sooner than it wold. — All shall be ours."

On the west side of the south transept there are two inscriptions, which, taken in connexion with a shield close by them bearing compasses and fleur-de-lys, seem to indicate that the French architect here left a record of his courtship of a Scottish muse:—

"John : Murdo : sum : tym : callit :
was : I : and : born : in : paysse :
certainly : and : had : in keping :
al : mason : werk : of : santan
dreys : ye : hye : kirk : of : glas
gu : melros : and : paslay : of :
nyddysdayll : and : of : galway :
pray : to : god : and : mari : baith :
and : sweet : sanct : iohn : to : keep :
this : haly : kirk : fra : skaith."

The second is still more Scottish. We give its modern reading first, to assist in its decipherings:—"As the compass goes round without deviating from the circumference, so, doubtless, truth and loyalty never deviate. Look well to the end, quoth John Murdo."

"Sa gays ye compas evyn about
sa truth and laute do, but doute
behaulde to ye hende q. iohne murdo."

Another touching, stirring kind of writing on masonry is that which State prisoners have traced on the walls of the dungeons in which they have been confined. Here we have trite reflections, expressions of faith, tender remembrances of absent and loved ones, records of facts, dates, names, initials, and ofttimes devices of considerable skill, both in design and execution. Of English State prisons, the Beauchamp Tower, in the Tower of London, has probably the largest number of these memorials. Whilst the Cheshire carpenter, Rychard Dale, was making the great bow-window at Little Moreton Hall, "by the grac' of God," there was a prisoner languishing in this stronghold, by name William Rame. Nothing is known of him, neither his offence nor his fate. But we can tell, as the bright spring days went by, he solaced himself with writing on the wall, for his work is to be seen at this day. It reads like a string of sad proverbs, setting the "howse of mornyng" before the "howse of banketing," and is dated April, 1559. His mourning, or lamentation, has a consolatory tinge in it, which, it is to be noticed, is very general in similar inscriptions. The peril of the prisoners, the proximity of death, their alternations between hope and despair, perhaps, too, a certain dash of adventure that must have been in most of their minds when led to take part in the enterprises or plots for which they were incarcerated, seems to have led many of them to look upon their lives as a journey just concluding. "A passage perillus makethe a port pleasant," wrote Arthur Poole, in 1568, on the pitiless walls of the same tower; and "*Per passage penible passons a port plaisant,*" wrote Thomas Rooper, 1570. The unfortunate Duke of Norfolk expressed the general feeling of those confined for their religious opinions when he wrote over the fireplace of this prison-house some Latin verses to the effect that the more suffering for Christ in this world, the more glory with Him in the next; and near a loophole, "It is a reproach to be bound in the cause of sin, but to sustain the bonds of prison for the sake of Christ is the greatest glory." "My hope is in Christ," "Typping stand and bere thy cross," are specimens of this feeling. The great benefit to be derived from patience is frequently laboriously set forth by the languishing souls in durance. "The most vnhapy man in the world is he that is not pacient in adversities, for men are not killed with the adversities they have, but with ye impacience which they svffer," wrote Charles Bailly, among other records of sighs and anguish, in 1571. "Grief is overcome by patience," wrote G. Gyfford on his prison wall in August, 1586, when "Ralph Done, Esquyer," was rejoicing over the completion of his house at Tarporley, and causing his delight to be engraved on the front of it. Some of the luckless ones learnt wisdom from their confinement, and perpetuated their conclusions on the stones, that so grimly kept them fast. "Wise men ought circumspectly to see what they do, to examine before they speake, to prove before they take in hand, to beware whose company they use, and, above all things, to whom they truste," wrote the young gallant Charles Bailly, who has recorded he was twenty-nine years of age when he arrived in England from Flanders, bearing letters in cipher for Mary, Queen of Scots, advising her of an attempt about to be made in her favour, and was seized on landing at Dover, and committed to the Tower.

"I leve in hope and
I gave credit to my frin
de in time did stand me
moste in hande, so wovlde
I never do again excepte
I hade hime sver in bande and
to al men wishe I so vales ye
svesteine the leke lose as I do,"

bemoaned Thomas Clarke, 1576. "*As vertue maketh life, so sin causeth death,*" another unfortunate incised upon the stones. But of all the memorials in this sad chamber, the most touching is the iteration of a woman's name. Graven on the stones, twice repeated, at some distance apart, we seem to have before us all that could be rendered into words of a burst of passionate anguish,—"Jane, Jane!" For this was the prison of Lord Guildford Dudley, the husband of the accomplished, youthful, and amiable Lady Jane Grey. Let us hope their terrible "perilous passage" ended in a "port pleasant."

Except in very occasional instances, we have left off writing upon our houses. We seem to have reserved all writings on stone for perpetuation of the memory of the dead on their tombs. But surely we are suffering a practice to fall into oblivion that has many things to be said in its favour. Especially all restorations of ancient work should be furnished with tablets recording the fact, for the enlightenment of posterity. It is not to be contested that inscriptions of suitable character, sense, situation, and size add an interest to a fabric, especially after the lapse of years. Does not the distich over Lady Lucy Reynall's hospital give us an insight into her pious mind, and make us picture her, as we fear her considerate provision reveals her to have been, a "poore widowe" in weeds and wimple? Do not the quaint Tudor lines of John Waldron, and Richoard his wife, of John and Jone Greenwaye, help us to portray these worthy merchants and their partners as fit members of the class of wealthy, successful merchant-adventurers, or merchant-princes, of which Edward Osborne, Thomas Gresham, and Richard Whittington are world-known examples? They are voices. If we would know a man, let us hear him speak; and these have spoken to us in this fashion.

ANAGNI CATHEDRAL.

Among the old towns in the Papal States least frequented, but well worthy to be visited by tourists, Anagni, the Anagnia of the Hernicians, to which Virgil gives the epithet "dives," is picturesquely conspicuous, and, seated on the long ridge of an isolated height amidst the cultivated uplands of the Frosinone province (anciently Latium Novum), looking towards two noble ranges of mountains: the Hernician on the east, the Volscian on the west: this decayed city, chosen residence of so many Mediæval popes, seems from a distance far more imposing and prosperous than it proves to be on nearer view. Among its tortuous, gloomy, and labyrinthine streets, one is often surprised by the relics of past magnificence, in fronts or fragments of fine architecture, porticoes with arcades, arched windows divided by colonnettes, Corinthian capitals and classic frieze; or, it may be, some nondescript animal-head, or other Gothic fantasy cut in marble, set into the rough stonework of modern houses. The Communal Palace, but a remnant of what it was as built in the fourteenth century, stands a heavy pile of sombre and imposing effect, pierced by a broad cavernous archway, with some fine old windows of three lights, under acute arches, divided by colonnettes, and framed in mouldings; armorial shields in stone emblazoning its dusky fronts, both on the sides of the streets and on that overlooking a court. But our principal business at Anagni is with the cathedral, noticeable on account both of its architecture and its contents, historic through its association with the memory of several pontiffs among the most illustrious of St. Peter's successors—particularly the high-spirited and unfortunate Boniface VIII. Local tradition states that the first bishop of this see was consecrated by St. Peter in person; and it is certain that its prelates may be counted in unbroken succession up to the seventh century. The actual cathedral church had origin in the eleventh century, though, no doubt, much altered in later ages, and in many details, especially those in the interior, indicating the style of the thirteenth and fourteenth centuries; the first historic notice of it importing that the primitive church on this site (referrible to very high antiquity, we may assume) was enlarged and embellished, probably quite renewed, by the Greek Emperor Michael (A.D. 1071-78), in gratitude for his recovery from illness through the prayers and merits, as he believed, of Peter, a canonized bishop of Anagni; but it was not till A.D. 1167 that the renovated edifice was consecrated by Alexander III., a pope who spent several years in this city, and who within this church's walls performed the canonization of St. Bernard; as it was in this same cathedral that St. Clara of Assisi was canonized by Alexander IV., A.D. 1256; that the Emperor Frederick II. was excommunicated by Gregory IX., A.D. 1227. The architecture actually before us presents an example of the transition between the Early Romanesque and the Italian Gothic, the round and the pointed arch being here placed together, though the former predominates both interiorly and exteriorly; instead of the coffered ceiling in flat woodwork, as common in Rome, is the stone vaulting over nave and aisles; and, instead of the classic columns (seen in Rome's basilicas), are heavy built-up stone pillars alternating with quadrate piers. The plain façade terminates in a gable, but the original form is lost owing to the raising of lateral walls above the lean-to roofs of the aisles, still visible under the more modern stonework. At each side of the single round-arched portal on this façade are set into the walls a variety of friezes, classic and barbaric, nondescript animals in rude relief, among other details, pieced together without plan or symmetry. Three apses project from the eastern end, behind the chancel, the central and largest of these with an arcade gallery near to its summit, at the springing of the arches in which gallery fantastic animal-heads alternate with the capitals of columns, neither shafts nor capitals being in those alternate spaces. Near one angle of the façade projects a quadrate structure, on whose outer front we see the outline of a walled-up acute arch, lofty and spacious, sufficing to indicate the former existence of an atrium with Gothic arcades, demolished in all but the portion now converted into a lateral chapel entered from the corresponding aisle. A lofty campanile, with walls that batter (or lean inwards), and stories of arcade-windows divided by colonnettes, stands isolated, at some distance from the façade, a remarkable structure, referred to the eleventh century, and indeed one of the best examples of the Mediæval belfry in these parts, though much maltreated by modern restorers, the ancient arched doorways being walled up, and the arcades, on one side, converted into large windows without any architectonic character. On the northern side of the church, high up near the cornice, is an arched recess with canopy and columns, containing a colossal statue of Boniface VIII., seated on a throne, in full pontificals, with one hand blessing, with the other holding the keys,—a figure rude in execution, but of marked character and dignified individuality, reminding of the recumbent portrait statue on that Pope's tomb at St. Peter's by the Florentine Arnolfo; but as to the authorship of this singular work, placed in so singular a position, on the Anagni Cathedral, we regret our inability to give information. The noticeable details in the interior of this church are,—the rich intarsio pavement of coloured stone; the massiveness of pillars and pilasters that support rounded arches, their capitals of the most rude simplicity, with fantastic animals coarsely sculptured, above the abacus in some instances; the wagon-vault roof of the nave; the elevated choir, and high altar under a graceful white marble canopy, with four

columns supporting architraves, a double story of light colonnettes above, and pyramidal roof, surmounted by a lantern of open work with globe and cross on its apex.

But the most curious, and no doubt oldest part, is the dim-lit crypt, divided into three aisles by columns, with light shafts and barbaric capitals, dimensions and orders different, the vaulted roof resting on stilted arches, three small apses projecting behind as many altars, and the whole extent of walls and vaulting covered with ancient frescoes, now in great part faded, many groups being totally effaced. These quaint pictures are believed (our authority is an intelligent canon of this cathedral) to be of date within the twelfth century. Among the best preserved are: "Christ Blessing (in the Greek form) with four Apostles beside Him," "Christ amidst the four Emblems of the Evangelists," "The Blessed Virgins amidst female Saints," "The Divine Lamb worshipped by the twenty-four Elders," who all wave censers; "St. Magnus, patron saint of Anagni," a seated figure, in episcopal robes, of some dignity; also groups of apostles, among whom St. John appears most frequently, and in each instance with a scroll in his hand, displaying the words, *In principio erat Verbum*. Not all, apparently, of the same date, these paintings are all characterised by more or less of rudeness and quaintness, the outlines of some figures being about half an inch thick; the expression in others rather pleasing, however childlike the incapacity manifest, and the general style of drawing either absolutely barbaric or giving some faint indication of the dawn of a better day in art-history. It would be interesting to confront these works with the wall-paintings lately discovered in the ancient, and now subterranean, *S. Clemente* at Rome.

In the sacristy of this cathedral is a very rich assortment of sacred objects,—vestments, censers, mitres, &c., no longer used, but now exhibited as curiosities, and all, we are glad to find, photographed for sale, in such copies, at a Roman establishment. Interesting are the numerous vestments, copes, chasubles, and dalmatics that belonged to Boniface VIII., and were all presented to the church by him; their texture of woven gold, covered with figures in needlework, the aggregate forming a most valuable monument of thirteenth-century, or,—if we refer them to the last years of Pope Boniface, who died A.D. 1303,—of fourteenth-century art; not, indeed, bearing any comparison to the designs of Giotto, and scarce showing more than incipient emancipation from barbarism. The subjects of the groups are Scriptural, legendary, and hagiographic. Among several scenes of martyrdom are the deaths of apostles, the Suffering of St. John in the Cauldron of Boiling Oil, St. Denis carrying his severed head in his hands, and (interesting to English eyes) the Decapitation of the Saxon king, St. Edward (put to death by the Danes A.D. 870), and the Murder of St. Thomas à-Becket, who is represented kneeling, whilst three armed assassins attack him, and one cleaves his skull with a long sword, opposite being seen the king, standing in a kind of tribune, hung with coloured cloth, in the attitude of one who gives orders,—a curious testimony to the idea admitted at the Papal Court as to the degree of King Henry's complicity in the death of the archbishop! Among legendary subjects, most singular are those from the story of St. Nicholas, who, in one group, appears in the act of causing two idols to fall from their pedestals, by virtue of his prayers; in another, discomfiting the Demon of the Storm—an ape-like monster—who seems responsible for a tempest on board of a ship out at sea. The Holy Trinity is represented with Father and Son, almost identical in type, age, and attitude, each in the act of blessing, seated beside each other on thrones, with the dove, in an oval nimbus, between. Most complete and best preserved are the Mysteries of the Gospel, from the Annunciation to the Ascension, with the additional legendary subjects of the Transit, the Assumption, and the Coronation of Mary, each group within a circlet on the gold tissue of a *humeral*, or veil for enveloping the shoulders at the rite of benediction.* A singular detail in the Annunciation scene, among these groups, is the manner in which the dove approaches close to the ear of Mary, conformably to the majestic idea respecting the mode of her preternatural conception expressed in an ancient hymn. But the veritable gem of the set is an altar-pallium, also presented by Pope Boniface, embroidered with figures of groups from designs ascribed to Giotto, and all, we should say, worthy of the great Tuscan master. The subjects range along two files. On the upper, the Virgin, with sweetly serious countenance, seated on a throne, the child on her lap; two archangels and six apostles each standing under a canopy with cusped arch and supporting columns. On the lower file, the martyrdoms of St. Peter, St. Paul, and St. Stephen; also the baptism and restoration to sight of the first-named apostle,—all treated in a manner that seems decidedly "Giottesque." Several vestments that belonged to Innocent III. are of crimson silk, stiff with gold embroidery in perfect preservation, but not artistic, the subjects mostly heraldic, as in the frequently-repeated crowned eagle, other birds, and flowers, suggesting the notion, that seems admissible enough, of the presentation of these gorgeous robes to Pope Innocent by an imperial ally. The many mitres seen here—some embroidered, others quite plain—are chiefly noticeable as proofs how different and much more modest in its low form was the mitre of old, as compared with those, so ponderous and top-heavy looking, now in use. A beautiful censer, one of Pope Boniface's gifts, exemplifies the taste for Gothic design in his day; and other objects in this sacred treasury are remarkable either for richness or on account of the contrasts they suggest. The general effects of things seen in the cathedral and in the street at Anagni is mournful. Too evident here, as elsewhere, are the cold neglect, the apathetic non-appreciation of the Middle Ages, their genius and creations, in Modern Rome as in the range of territory still under her sway.

* Used also by the deacon, whilst he carries the paten at High Mass; and at benediction by the priest, who elevates the ostensorium containing the Holy Sacrament.

LECTURES TO WORKING MEN.

The Council of the Working Men's Club Union are arranging a list of gentlemen willing to give lectures in the different Working Men's Clubs and Institutes connected with the society in London. It is proposed that the lectures shall be delivered at the various club-rooms, which are but small, admitting an audience of about 150 in number. We would suggest, that should some good lecturers be obtained, the provision of a central apartment of larger capacity, which would accommodate the members of, say, four or five of the clubs, might be desirable, as more fully utilising the lecturer's services. Probably, however, the council have learnt that, while the members of a club might be disposed to go to their own room to hear a lecture, only a part of them would take the trouble to walk half a mile out of their way to do so. There is a terrible apathy in all quarters, which has to be overcome.

THE "BUILDER'S" LAW NOTES.

Injury by Fellow-workmen: Liability of Master. A scaffold was erected for the purpose of sinking a pit and making arrangements underground for opening a new seam in a certain coal-pit in Scotland. The owners had a manager for the pit, and they had also a general manager over all their works. The pit manager had the charge of sinking the pit. Two days after the erection of the scaffold a workman was engaged by the owners to assist in driving the level. While so employed he was killed by an explosion of firedamp, the accumulation of which was caused by the obstruction to the ventilation occasioned by the erection of the scaffold. It was admitted that both the managers were competent persons selected for their duties with proper care. An action was brought by the mother of the deceased for damages in consequence of his death, and the judge told the jury that if they were satisfied that the arrangement or system of the ventilation of the pit at the time of the accident had been designed and completed by the pit manager before the employment of deceased, and if the owners had delegated to such manager all their authority in regard to the matter, that such manager and the deceased did not stand in the relation of fellow workmen engaged in a common employment, and that the owners were not relieved from liability. A verdict was given for the plaintiff. Exceptions were taken to the charge, and one of the exceptions was allowed, and a new trial granted. The plaintiff appealed to the House of Lords against such allowance, but it was confirmed by that House. The Chancellor said that the liability of a master to his workmen does not depend on the question of the author of the accident being a fellow-workman. The master is not liable to his servant unless there be default on the part of the master in that which he has contracted to do. He does not contract to execute in person the works connected with his business. What he is bound to do in the event of his not personally superintending the work is to select proper and competent persons to do so, and to furnish them with adequate materials and resources for the work. If the persons so selected are guilty of negligence it is not the negligence of the master.—*Wilson* v. *Merry*.

Clay-pits: Rates.—A person had an exclusive licence to enter upon lands in two parishes and take clay. Under this licence he worked certain clay-pits, and carried on a trade in clay in one parish, but he did not work any clay-pit in another parish, though he had the licence to do so. The surface of the land in the latter parish was let to a farmer; and it was held by the Court of Queen's Bench that the person having the licence was not rateable in the latter parish as an occupier of clay-pits, but only rateable in the parish in which he actually worked clay-pits under the licence.—*The Queen* v. *Fayle*.

THE NEW SANITARY ACT.

Amongst the statutes passed in the late session was one (chapter 114) briefly entitled "The Sanitary Act of 1868," having for its object the making of additional provisions for the removal of refuse matter from dwelling-houses. The Act only extends to England. It commences (after some definitions) with reciting the 51st and 54th sections of the "Public Health Act, 1848," which require that every new house and every house pulled down to or below the groundfloor and rebuilt, shall have a sufficient water-closet or privy and ashpit, and also that the Local Board of Health shall see that drains, water-closets, privies, and ash-pits within their district do not become a nuisance. The new Act then proceeds to extend those sections to the district of every "sewer authority in which district there is no enactment in any public or private Act of Parliament to the like effect in force." "Sewer authority" in this Act is to have the same meaning that it has in "The Sewage Utilization Act, 1865," and to be construed as if the phrase used were "local board." Any officer appointed by the "sewer authority" to examine any premises shall be deemed to be the "surveyor" within the meaning of the said sections. Where the sewer authority and the nuisance authority of a district are different bodies of men, the jurisdiction of the nuisance authority is to cease within such district in relation to all matters within the purview of the abovementioned sections of the "Public Health Act, 1848;" and any sewer authority to whose district the said sections are extended making default in enforcing their provisions shall be subject to proceedings under the Sanitary Act of 1866 in the same manner as if it had made default in providing its district with sufficient sewers. Each sewer authority shall, within its district, have all the powers vested in a local board by the "Local Government Act of 1858" (as amended by any subsequent Act of Parliament) so far as relates to the removal of house refuse from premises, and the cleansing of privies, ash-pits, and cesspools. Where the sewer authority and the nuisance authority, in any district, are different bodies of men, the jurisdiction of the former in such district shall cease in respect to all matters over which the latter acquires power. The provisions of the "Public Health Act, 1848," relating to private improvement expenses (as amended by any subsequent Act of Parliament), shall be deemed to be incorporated with this Act so far as may be required for carrying it into effect. Any enactment requiring the construction of a water-closet shall, with the approval of the local authority, be satisfied by the construction of an earth-closet, or other place, for the reception and deodorisation of fœcal matter, made and used in accordance with any regulation, from time to time, issued by the local authority. That authority may, as respects any houses in which such earth-closets or other places are in use with their approval, dispense with the supply of water re-

quired by any contract or enactment to be furnished to the water-closets in such houses, on such terms as may be agreed upon between such authority and the persons required to provide the supply of water. The local authority may themselves undertake (or contract with any person to undertake) to supply dry earth, or other deodorising substance, to any houses within the district, for the purpose of earth-closets or the places referred to above. The local authority may themselves construct (or require to be constructed) earth-closets in all cases where under any enactment in force they might construct water-closets, or require them to be constructed. No person shall be required to construct an earth-closet instead of a water-closet if he prefer to comply with the Act requiring the construction of a water-closet, and a supply of water for other purposes is furnished to such house. No person is to be put to greater expense in constructing an earth-closet than he would be put to in the construction of a water-closet. After some sections (which we need not set forth) respecting the recovery of expenses and the enforcement of penalties, the Act provides that the sewer authority (or, in the metropolis, the nuisance authority) shall have the same power with reference to the temporary supply of medicine and medical assistance for the poorer inhabitants as it now has to provide hospitals or temporary places for the reception of the sick by the "Sanitary Act of 1866," subject to the previous sanction of her Majesty's Privy Council.

THE ISLINGTON NEW WORKHOUSE.

THE ARCHITECT, THE CLERK OF THE WORKS, AND THE BOARD OF GUARDIANS.

On the 28th of August the Islington Board of Guardians passed a resolution (on which we commented) that the clerk of the works at the new workhouse at Highgate should send in weekly reports to them—1st, as to work done and number of men employed; 2ndly, whether any stoppage has occurred, and why; 3rdly, as to any inferior material brought on the ground, whether such has been used after being condemned by him, with copies of any communications made either to the architect or builder with respect to the same, with their replies; 4thly, whether such material has been taken out and removed from the ground after complaint, and generally to report anything and everything affecting the stability of the building. Mr. Burden, the architect, complained to the Board of Guardians that it was not the custom that the clerk of the works should report to them; he ought to send in his report to the architect, and it was for the architect to report to the Board. The Board granted Mr. Burden an interview, in order to allow him to explain and support his views before them. Mr. Burden contended that the clerk of the works should be at the disposal of the architect, and every report should come through him and not through the clerk of the works, Mr. Lewis. The Chairman, on behalf of the Guardians, said that they consider the clerk of the works their servant, as they paid him. Mr. Burden said that, although they paid Mr. Lewis, the custom of the profession made him the servant of the architect. It would be very inconvenient for the clerk of the works to turn round upon the architect and say he was independent of him. Mr. Lewis's influence with the contractors would be lessened unless he derived his power directly from the architect. He, moreover, objected to the clerk of the works having power to condemn materials, or to pronounce any judgment on the stability of the building. For the clerk of the works to report at all was a new thing to him. The architect's monthly report was quite sufficient. The Guardians expressed themselves opposed to doing anything that would tend to lower Mr. Burden in his office as architect, but at the same time said they were determined to watch the work most zealously. As nothing could be done without previous notice of motion, the subject was adjourned until the following week.

At the next Board meeting a letter was read from Mr. Lewis, clerk of the works, expressing his surprise that the architect should reserve to himself the power of condemning bad materials. It was important that, when an attempt was made to use bad materials, they should be at once condemned, as, were they left to be worked in, they might deceive the most experienced eye. He considered it the duty of the clerk of the works to condemn materials in the first instance, and then report to the architect for his final decision. If Mr. Burden reserved the power to himself, the builders would ignore the clerk of the works altogether. Mr. West brought forward his motion that the resolution empowering the clerk of the works to condemn bad material should be rescinded, as being contrary to the contract. Several guardians were of a contrary opinion, when the clerk informed them that the contract said that either the clerk of the works or the architect could "reject" bad materials; but, in the event of any dispute between the builders and superintendents, the decision of the architect alone should be binding. Mr. Cufflin moved an amendment that resolution 3 should be rescinded; but the amendment was lost. Mr. Box then moved that the words "together with copies of any correspondence," in resolution 3, should be rescinded, and the word "rejected" be substituted for "condemned." Mr. Fairbank seconded, remarking that they had had ample proof that the builders had not been working in a very straightforward manner. Mr. Cufflin replied that in the best of works bad materials would be used sometimes without the builder's knowledge. Mr. Box's motion was put and carried. The fourth resolution was entirely rescinded as being superfluous, and thus matters stand for the present between the architect, the clerk of the works, and the Islington Board of Guardians.

NEW THEATRE OF MUSIC AT WEST HARTLEPOOL.

This building, which was opened on Monday, the 21st ult., is capable of accommodating 2,000 persons. The form of the auditorium is three parts of an oval, having its termination at the proscenium, which has an opening of 25 ft., and represents a picture-frame of rather massive character. The gallery front recedes from the box front, and forms an awning. Pains have been bestowed on the stage. With reference to the ventilation, the pure air in a rarefied state is admitted by means of numerous inlets and flues, and the vitiated extracted by means of the air-shaft immediately over the sunlight. Messrs. Thomas Moore & Sons, of Sunderland, were the architects; and Mr. Gibbon, of Hartlepool, was the contractor. The gasfittings were put up by Mr. T. Sherwood.

RESTORATION OF PERIVALE CHURCH.

The most thinly populated parish in the metropolitan county is Perivale, the number of householders being but four. The parish is situated in a fertile and deliciously verdant vale, through which stealthily creeps or tortuously winds one of Father Thames's smallest tributaries, the gravelly Brent. Just where the stream takes a westerly course, upon the north bank, where it is unusually elevated, stands the smallest church in Middlesex,—a pile of chalk reared at least 600 years since. It consists of nave and chancel, with a south door and a west door, each having an arched head, lancet-shaped outside and segment-pointed inside, the walls being 2 ft. in thickness. The roof is high pitched, and was doubtless once open-timbered, with braces, forming a lancet arch, which appear to have been lathed and plastered in the days of the Puritans. Besides the two doorways, there is left of the original edifice an octagonal font and a hole where the east window was. At a much later date the original nave windows appear to have been replaced by some two-light Tudor windows. The benches also appear to have been put up in the fifteenth century, as well as the pulpit and some memorial brasses. Indeed, but for the doors, the east window, the high-pitched roof, and the fact of the walls being of chalk which must have been brought at least eight miles, the church would be taken for a fifteenth-century one. It appears to have suffered considerably at the hands of the Puritans, and again in the Georgian age.

This interesting relic of Mediævalism has been restored, evidently by loving hands, and re-opened for divine service. The outside remains unaltered, with the exception of the addition of another two-light window in the south wall, a faithful copy of the old one. The inside, however, has suffered a complete metamorphosis. A new organ-chamber has been built; the pews are gone, the rood-screen is no longer seen, and the heavy classic altar-rail is replaced by one designed in the spirit of the ancient builders. The floors of nave and chancel are relaid. The whitewash enamel is scraped from the timbers, and they are no longer supposed to be marble or slate; but we are sorry that the restorers should want us to think it oak, by graining it. We would suggest the destruction of all the Puritanical and Georgian anomalies, such as the east window, the porch, and the Punch and Judy construction called the tower. Then the restoration will be complete.

The architect who superintended the alterations was Mr. Charles Jones, of Ealing; and the whole of the works have been carried out by Mr. Nye, of Ealing, builder.

BUILDERS' CLERKS' BENEVOLENT INSTITUTION.

AN APPEAL TO BUILDERS.

Sir,—From the press that has rendered to the above cause such powerful aid, permit me to seek still a little further assistance; it is only through its medium that we can get aid from the rich and willing, or acquaint the deserving destitute of temporary aid or permanent relief. Our first election takes place next Monday evening, at the Institution, when two widows of builders' clerks, late in the employ of leading London firms, will be elected to the pension of 15*l.* per annum. The applicants are thoroughly destitute; one has three children under twelve, the other nine under seventeen years of age.

It is, indeed, a pleasing satisfaction that the committee are enabled at such a juncture of distress as this at once to offer some permanent assistance.

With the knowledge that still more is required, I earnestly appeal for aid; but I more particularly respectfully solicit the profession, merchants, builders, and others, to aid the endeavours being made to secure the election of one of the children of the last case I have mentioned, into the Orphan Working School, at Haverstock-hill. To secure the election the first time, the difficulties are great: the case is a very sad one, and deserves the support of all your readers. Votes will be received by any of the committee of our Institution. The election is sure if our building friends have sympathising and willing hearts to help us. T. P. W.

THE SCIENCE OF COLOUR.

Sir,—If I may add to my former communications on this subject, and to the extracts which appeared in the review of my treatise in your number for 25th July last, a short statement of the principal facts which refute the common theory of colour, and seem to me to establish the amended theory which I have ventured to maintain, it may prevent some misdirected labour and loss of time in such as desire, like Mr. Colling, to investigate the subject for themselves.

1. A mixture of those red, green, and blue rays of the pure spectrum whose colours are best represented in paints by scarlet vermilion, emerald green, and ultramarine or French blue, without any of the other rays, will produce the sensation of white.

2. These three are the deepest, or most powerful in proportion to their brightness, of any three of the prismatic colours which are capable of producing white.

3. All the other prismatic hues may be produced by mixtures of these three, with the same depth as that which they have in the spectrum; namely, orange, yellow, and yellow-green, by mixtures of the red and green, and sea-green and all hues intermediate between it and green or blue, by mixtures of the green and blue; and therefore all possible colours in nature may be produced by mixtures of the prismatic red, green, and blue, in various proportions. But all the prismatic hues cannot be produced, with the depth they possess in the spectrum, by mixtures of any other given prismatic colours besides these three.

4. From these facts, which have been proved by Maxwell's experiments (Phil. Trans. 1860), and are also in accordance with the fact that every eye which has the ordinary capacity for discerning colours, judges these the most striking

colours in the pure spectrum, it is reasonable to conclude that the prismatic red, green, and blue present the nearest approach to three simple sensations of colour, and that all possible colours consist of mixtures of these.

5. Continuous combinations of the prismatic colours, placed in juxtaposition, show that the deepest and brightest blues, best represented in paints by ultramarine and cobalt, are exactly complementary to the clearest and brightest yellows, best represented in paints by lemon yellow and king's yellow.

6. The combination of the best blue and yellow lights, in whatever way effected, produces a neutral gray or white; and though the combination of blues and yellows approaching more or less to seagreen-blue, and yellow green, will produce a pale green; no deep or powerful green (such as that of emerald green) can be so produced.

7. The analysis by the prism of the best natural reds, greens, and blues, shows that they are produced solely by the prismatic rays in which those colours respectively predominate; but the like analysis of the best natural yellows shows that they are produced by all the red and green prismatic rays, as well as by the intermediate yellow rays.

8. From these facts it is evident that if blue is one of three simple sensations of colour, yellow cannot be another of them, but must be a binary compound of the other two; a conclusion which is also confirmed by the ocular modification of white when viewed in conjunction with bright blue or bright yellow, or immediately after the same.

If I have, as I fear, expressed myself in my former communications with a somewhat unbecoming warmth or confidence, I hope I may be excused when I assure your readers that I did not venture to reject any part of the common theory of colour without much research and many experiments. The subject necessarily requires thoughtful and patient investigation; but I am persuaded that the result of arriving at correct conclusions will amply repay the trouble to those who would produce good and varied effects in colour.

W. Benson.

OUR BLACK DIAMONDS.

Coal is a black opaque mineral substance of vegetable origin. Its specific gravity varies from 1·25 to 1·75. Its chemical constituents are carbon, hydrogen, nitrogen, and oxygen. The chief constituent or basis of coal is carbon; the other substances are volatile. When coal is rich in hydrogen and oxygen, and poor in carbon, it is bituminous; and when it is rich in carbon and poor in hydrogen and oxygen, it is non-bituminous. Coal does not contain any actual bitumen, only the constituents of it. Bitumen is the result of the decomposition of vegetable matter, and may be extracted from coal by distillation. The bituminous varieties of coal are less hard, compact, and lustrous, and more inflammable than the non-bituminous, which are often made into articles of use and ornament, besides being used as fuel.

Carbon in coal and oxygen in air have great affinity for each other. The moment fire is applied to the coal the oxygen rushes to the fire and supports the combustion. The combination of the oxygen with the carbon produces carbonic acid, and with the hydrogen aqueous vapour. The process of oxydation evolves heat, which is increased or diminished by the speed with which the products of oxydation are allowed to escape. When the combustion is perfect the resulting gases are nearly invisible, but when it is imperfect smoke is produced. It is not possible in the ordinary open fire-grate to prevent the formation of smoke, or wholly to consume it; but much may be done by careful firing to prevent it, and to consume it. Those who desire a clean hearth, and a bright cheerful fire, must take pains to manage it. The fire should be fed frequently, with a small quantity of coal each time, between the front bars, and amidst the hot embers at top. If the ashpit be made to close in front, so as to exclude air from under the fire, there would be great saving of fuel, and the fire would burn steadily.

There are nearly one hundred varieties of coal, about seventy of which are imported into London. All of them differ in quality, and also in lighting and heating power; but the difference in many is so slight as to be undistinguishable except to those conversant with them. They may be arranged as anthracite-coal, pit-coal, and brown-coal.

Anthracite-coal is common in South Wales. It is also found in some English, Scotch, and Irish coal fields. Its composition, by weight, is 92·56 per cent. of carbon, 3·33 of hydrogen, 2·53 of nitrogen and oxygen, and 1·58 of ashes. Hence it is exceedingly rich in carbon, poor in volatile substances, and is non-bituminous. Some samples of this coal, of great purity, yield as much as 98 per cent. of carbon. It has an iron or greyish black colour, and a metallic lustre. It is very hard and brittle, ignites with difficulty, but burns steadily with a strong draught. It is nearly smokeless, burns with little or no flame, and gives out an intense heat, sometimes melting the furnace bars. It does not cake in burning, contains little sulphur, and leaves little ash. It is used largely in iron works for manufacturing metals, and in ocean steamers for generating steam. Its calorific effect for these purposes is much greater than Newcastle coal. Owing to its hardness and compactness, its power of conducting heat through itself is very slow. If it be exposed to great heat at first, the outside will expand more than the inside, and break off in small pieces. To obviate this, and to assist the combustion, it requires to be gradually heated.

Pit-coal has many varieties; indeed, they are as numerous as the seams of coal; and sometimes the same seam differs in character and quality at different parts. Some varieties of pit coal have popular and local names; such, for instance, as *furnace-coal*, which is used for smelting, smiths' work, &c.; *gas-coal*, used for manufacturing gas; *steam-coal*, used for generating steam; and *house-coal*, used for burning in stoves and fire-grates. All these varieties, which are more or less bituminous, are classed under four heads:—1. Caking-coal. 2. Splint or hard coal. 3. Cherry or soft coal. And 4. Cannel or parrot coal.

1. Caking coal is obtained in great abundance from the coalfields of Northumberland and Durham; also from those of Cumberland, Lancashire, Derbyshire, and other parts. Its constituents by weight, are 75·28 per cent. of carbon; 4·18 of hydrogen; 1·96 of nitrogen; and 4·58 of oxygen. It is velvet black; is middling hard and brittle, breaks easily, and ignites readily. It melts or falls to pieces when heated, makes a bright pleasing fire, with attention burns a long time, and gives out great heat. As, after lighting, the heat increases, the pieces unite or cake (whence its name), and form a solid mass, which requires frequent stirring. Some kinds of this coal burn slowly, cake hard, and send out a strong long-continued heat; while others burn quickly, cake soft, and give a weak, short continued heat. As this coal contains only 1½ per cent. of earthy matter, it leaves but little ash and little cinder. One bushel of it weighs 84 lb. It yields about 40 per cent. of bitumen. This coal is the most useful and economical for household purposes, and is that commonly sold in London as Newcastle or Wallsend coal. It makes the best coke, 1,000 lb. of it yielding 774 lb. when made in an oven. It is also a good steam-coal.

2. Splint or hard coal is obtained from the coal-fields near Glasgow, in Ayrshire, and in England and Wales. Its composition by weight is 75·00 per cent. of carbon, 6·25 of hydrogen, 6·25 of nitrogen, and 12·50 of oxygen. The coal called culm is an inferior quality of it. Splint coal is black, with a brown tinge, and splinters when broken, whence its name. It is much harder, breaks less easily, kindles less quickly, requires greater heat to make it burn, burns with less flame, and makes less smoke, than caking coal. As this coal does not cake when heated, it is not so well adapted for small fires as caking coal; but a large body of it makes a strong lasting fire. It is almost non-bituminous. When prepared in a coke-oven, 1,000 lb. of it will afford 647 lb. of coke. It contains 9½ per cent. of earthy matter.

3. Cherry or soft coal is obtained near Glasgow, in Fifeshire, and abundantly in Staffordshire. Its constituents by weight are 74·45 per cent. of carbon, 12·40 of hydrogen, 10·22 of nitrogen, and 2·93 of oxygen. Its colour is velvet black with a grey shade. It has a resinous lustre, breaks easily with a shaly fracture, takes fire readily, burns with a continuous clear flame, gives out much heat, produces little cinder, and leaves a light white ash. As it also does not melt and cake when heated like caking coal, it requires little stirring; but it burns away more rapidly, creates less heat, and is less economical than either caking or splint coal. In an oven 1,000 lb. of it produce 522 lb. of coke; and it contains 10 per cent. of earthy matter.

4. Cannel or parrot coal is obtained from Scotland, Derbyshire, Lancashire, Yorkshire, and other parts. Its composition by weight is 64·72 per cent. of carbon, 21·56 of hydrogen, and 13·72 of nitrogen. It burns readily with a clear flame like a candle, whence its name, but with much smoke. It is compact, fractures sometimes shaly, and varies much in appearance from a dull earthy to a bright shiny lustre. This latter variety burns like wood, leaving little cinder, and a white ash, while the former retains the shape and size of the original lumps. It contains about 20 per cent. of bitumen. It is seldom used, except locally, as a household coal, but it is admirably adapted for, and much used in, the manufacture of gas. Some very hard shiny qualities are made into toys and ornaments and sold as jet. This coal contains 11 per cent. of earthy matter.

Brown coal, known also as lignite, is of recent formation. One kind of it is soft and mellow when first quarried, but becomes hard and brittle by exposure to the air. In this kind the structure of the plants from which it is derived is little altered,—their stems and fibre are seen crossing in all directions. Another kind of this coal appears as a dense stratified mass, nearly black, fracturing easily, and sometimes presenting indications of vegetable structure. This variety, like that of Bovey, in Devonshire, is scarcely distinguishable from ordinary coal.

To those who are not conversant with the particular kinds and properties of coal, these remarks may be of service in enabling them to order, distinguish, and use that coal which is most applicable for the purpose required.

John Phillips.

SOAP AND ALUM FOR KEEPING OUT WET.

Sir,—I am very glad to see that your correspondent, Mr. Arthur Chambers, confirms my experience as to the efficiency of the soap and alum process for rendering the faces of brick walls impervious to wet. Some years since I brought this "dressing" to the notice of the Institute of British Architects, and I believe there are many members who can bear witness to its success, *if properly applied*. I know a case where a tenant gave notice to leave his house unless it was coated with cement. The landlord refused to have the brickwork disfigured by plaster. The solution of soap and alum was applied, and with complete success. I do not go quite so far as Mr. Chambers, and declare it to be a certain cure. I think it might fail in cases where the brick or stone is very porous; but unquestionably, when applied to a closely-grained material, it will succeed.

In a discussion a few sessions since at the Institute I directed attention to this simple and inexpensive process as applicable to the stone-work of the new Houses of Parliament; and I feel confident that it might be very beneficially applied to that building. When properly used it is by no means injurious to the effect of the stone, but, on the contrary, imparts a greyish tone, which is most agreeable to the eye.

Benjn. Ferrey.

DESIGN OF LODGES.

If you agree with me on the importance of the subject of this letter, you may think it well to bring it before the public in some suitable form.

I observe, not only in this country, but in others also, a studied misconstruction of lodges or gate-houses. They are, almost invariably, level with the damp earth, uncellared, with 7 ft. or 8 ft. ceilings, and windows too small for healthful ventilation.

Now, without considering the life, health, or usefulness of the occupants, I ask, Are not such structures miserable *frontispieces* to a handsome mansion and ornamented grounds? Will not good taste, if not humanity, reform this mistake?

A.

AIRING HOUSES.

Sir,—Can any of your country or scientific correspondents kindly say at what *point of, outside, atmospheric humidity* it is not beneficial to open the windows of an uninhabited house in the country during winter? and which instrument, if any, is best for determining this humidity? The house is regularly fired, but the housekeeper, a gardener, seems to dread an open window.

Country House.

THE ELEVATIONS IN THE REGENT'S PARK.

Sir,—In the leases of the houses in the Regent's Park, the whole of which is Crown property, it is provided that no addition or alteration shall be made to the exterior of the houses; and so important was it considered at the time of laying out the park, that the architectural appearances of the terraces and blocks of buildings should not in any way be injured, that it is also provided in the leases that the exteriors should all be painted at the same time and at certain periods, and at those times only; yet I perceive n one of the houses in Chester-terrace an extra story has been added, thus disfiguring the frontage of the terrace.

I consider that in making in the original lease the proviso that no additions or alterations should be made to the exteriors of the houses the public were taken into the compact, the park being Crown property; and I would ask, is it right that the appearence and architectural effect should be destroyed to accommodate any individual?

The terraces will soon become as disfigured and spoilt in appearance as Regent-street or Park Crescent: the Circus at Oxford-street may be cited as an effort terribly disfigured by additions,—but these are, I believe, private properties, and not crown property.

As Parliament is up, there are no means of getting a question put to the "Woods and Forests" on the subject in the House of Commons: I therefore trust, Mr. Editor, you will call attention to it: a word from you will perhaps bring the attention of the authorities to the point, and either have the excrescence removed, or an intimation sent to all house proprietors in the Park that they are at liberty to make any and what additions they like to their properties. House Proprietor.

THE APPROACH STREETS, HOLBORN VIADUCT.

Sir,—"What's in a name?" "A rose with any other name would smell as sweet." If little in a name, how much in an apology for a name? Does not the naming of these approach streets show a poverty of ideas somewhere? Should not such important thoroughfares be *really* named? Are there none to mark the era in which they are built? I presume there will be four approaches: why not "Napier," "Magdala," "Theodore," "Abyssinia?" They would then commemorate the most heroic episode in modern history, one that shows that the age of chivalry has not passed. If the approach idea must prevail, why streets? Would not simply approaches be preferable?

Only a Tailor.

BIRMINGHAM NOTES.

After a depression in demand and prices extending over a period of nearly three years, the manufacturers of builders' hardware in Birmingham are beginning to experience a steady return to something like activity. This is just the commencement of the "season" for stove-grates, cooking-ranges, and other descriptions of foundry-ware fixtures, and already the workpeople are having full em ployment. Ornamental iron gates and palisades are in tolerable request, but Coalbrookdale takes the "cream" of the trade in this department. Locks, hinges, bolts, and latches are in fair demand both in this town and at Wolverhampton and Willenhall, where the ordinary qualities are most largely made. Wrought-iron bridge and girder making is occupying a greater number of "hands" than reported for two years past. Metal-ware is gradually improving in demand, but prices are remarkably low, and there seems to be no prospect of any immediate movement in this respect. Among the latest novelties in builders' hardware may be mentioned, iron japanned finger-plates for doors, which are being produced by an enterprising firm in Willenhall at sixpence per pair. They are said to be equal to the china plates for which 1s. 6d. or 2s. per pair is demanded, and of course in point of endurance the latter will bear no comparison. A lock and finger-plate combined was also shown to us the other day, but this "invention" savours more of the curious than the useful. The increased application of machinery to the bolt trade is tending to improve the style and workmanship of those articles, besides facilitating production, and thereby lowering the price. The lock trade, which hitherto has not availed itself of recent scientific invention, is also taking a step in the same direction. Owing to a wages dispute in the "fine-plate" branch at Wolverhampton, some of the makers intend to render themselves less dependent upon the workpeople by introducing machinery on an extensive scale. This step will likewise benefit the consumer by reducing the cost of the article. The Birmingham people are favoured just now by the South Kensington department of the Civil Service. An extensive load of metal-work (chiefly Mediæval) has been made to the Free Library, where the collection of articles is now being exhibited. The locks, hinges, and bolts are especially fine, and there are several cabinets, and a *serrure de tabernacle* of the Middle Ages, which excel in design the elaborated door furniture at Haddon Hall.

NEW RELIEF OFFICES IN ST. PANCRAS.

In the *Builder* of the 15th August, were described the new Relief Offices and Dispensary for the parish of St. Pancras, situated in Compton-place, near Burton-crescent. The second of the series of four Relief Offices, designed for the parish in accordance with the provisions of the Poor Relief Act of 1867, has been completed this week. It is situated in Leighton-road, Kentish Town, occupying the house and grounds hitherto known as Bower Cottage. It differs from that in Compton-place in having no dispensary attached, though provision is made for the addition when required; while the ample site, which comprises an area of nearly half an acre, has afforded space for the construction of extensive labour yards, stone-breaking sheds, and oakum-picking rooms, for the employment of able-bodied paupers.

The old cottage, which is attached to the rear of the chapel buildings has been retained, with only such modifications as were found necessary to connect it with the new buildings associated with it. It is two stories in height, and on the upper floor are the apartments of the resident superintendent. The committee-room is on the ground floor, and with the store-room adjoining, completes the accommodation provided by the old cottage.

What was formerly a dining-room is now divided longitudinally, forming separate pauper entrances and exit passages to and from Leighton-road and the new waiting-room. Between the new waiting-room and the committee-room are situated the new relieving offices-room and the bread-room. By the parallel passages or corridors, direct access is gained to the waiting-room, returning past the relief-office, bread-room, and committee-room, each of which communicates with this exit corridor, which is widened opposite the bread-room and committee-room, forming lobbies to the same in the order indicated. The waiting-room has a lofty open roof, lighted by a large lantern skylight. A portion of ground is fenced in to admit of the enlargement of the waiting-room as well as for the erection of surgeons' rooms and dispensary.

The labour-yard is reached by a road on the west side of the chapel, and is an open quadrangular yard, which measures about 125 ft. by 70 ft., and has been paved with Penmaenmaur granite cubes by Messrs. Sewell & Son. On three sides of the yard stone-breaking sheds are ranged. These sheds are divided into double boxes by dwarf partitions, and afford space for ninety-four stone breakers. The sheds are tiled with corrugated red and white tiles, and present an effective appearance as they slope from the back boundary walls towards the yard, to which the boxes are open, cast-iron pillars supporting the eaves-bearers between each division.

The superintendent's office and implement store-room are placed in the centre of the range of boxes on the north side of the yard, immediately opposite the entrance road. On either side of the superintendent's offices are the entrance lobbies to the oakum-picking and store rooms, which are situated behind the boxes, the whole width of the northern side, or 137 ft. in length by 14 ft. wide. Accommodation is provided for 100 oakum-pickers in two long rooms fitted with tables and benches; between these rooms are the picked and unpicked oakum store-rooms. All these rooms are lighted by skylights, and carefully ventilated by louvre and other wall ventilators, and are warmed by open fire stoves with warm-air chambers, through which the air from within is passed into the rooms and warmed in its passage.

The architect is Mr. E. C. Robins; and Messrs. Thomas & Son undertook the contract at the sum of 1,735*l*.

WORCESTER DIOCESAN ARCHITECTURAL SOCIETY.

On the second and last excursion of this society for the season Alcester, Coughton Court, and the Marquis of Hertford's mansion at Ragley, have been visited. There was a large muster. By permission of Sir W. Throckmorton, bart., the fine old edifice of Coughton Court was first inspected, and the party then proceeded to Coughton Church, where Mr. Walker discoursed on the ancient history of Coughton, and Mr. Tomes criticised the old painted glass. Alcester was next visited. Luncheon had been provided at the Swan Hotel, and was presided over by the Rev. Canon Seymour. The party afterwards proceeded in carriages to Ragley, the neglected seat of the Marquis of Hertford, who has long resided in Paris. The visitors were escorted through the state rooms and library. Arrow church was next examined, and Mr. Walker read a paper detailing the history of the church. Here Mr. Walker announced that though the rector of Arrow, the Rev. Beauchamp Stannus, was prevented from being at home, yet he had invited the company to partake of tea and coffee at the rectory, and the day being so fine, it had been set out in the gardens. In the advancing evening the carriages were called for Redditch, where, safely arriving, the return was made by rail to Worcester.

AN ATLANTIC TELEGRAPH WITHOUT A CABLE.

Our readers may recollect of the experiments, some years since, of a Dundee gentleman, now deceased, in course of which he was said to have telegraphed by electricity across Portsmouth Harbour by permission of the Government, and also across the Tay, without any apparatus except galvanic arrangements on shore at right angles to the course of the message. This gentleman (we forget his name) even maintained the possibility of so telegraphing across the Atlantic Ocean, only he stipulated the arrangement of transverse lines, that in Britain running north and south through a great part of the country. The same idea essentially has been taken up by a Mr. J. H. Mower, in America, as a discovery of his own. He is said by the *New York Herald* to have already telegraphed east and west across Lake Ontario—from a point near Toronto, Canada West, to one on the coast of Oswego county, New York—a length of 138 miles, transmitting his message, without a wire, from a "submerged machine" at one end of the route to one at the other. The messages and replies were continued for two hours, the average time of transmission for the 138 miles being a little less than three-eighths of a second. The upshot of the discovery—on what principle Mr. Mower is not yet prepared to disclose—is, that "electric currents can be transmitted through water, salt or fresh, without deviation vertically, or from the parallel of latitude." The difficulty from the unequal level of the tidal waves in the two hemispheres will be obviated, it is claimed, by submerging the apparatus at sufficient depth. The inventor is preparing to come to Europe to secure here the patent rights for which the caveats have been filed in the States. At the inconsiderable cost of 10,000 dollars he expects within three months to establish telegraphic communication between Montauk Point, the eastern extremity of Long Island, and Spain, the eastern end of the line striking the coast of Portugal at a point near Oporto. The statement is enough to take away one's breath; but, with the history of the telegraph before us, we no more venture to deny than we do to affirm its possibility.

OPENING OF THE MIDLAND TERMINUS AT KING'S CROSS.

The great terminal station of the Midland Railway in Euston-road, St. Pancras, close to the King's Cross terminus of the Great Northern, has been (somewhat prematurely) opened, although the works are still in a very immature state. The vast arched span of the station area is already roofed, or nearly so, but the frontage is not yet raised much above the hoarding. The whole range of houses eastward to the Great Northern station has been removed, as some time since suggested in the *Builder*.

FROM SCOTLAND.

Dumfries.—The *Dumfries Courier* gives a detailed description of Greyfriars Church, recently completed. The church occupies the site of what for nearly a century and a half was known as the New Church at Dumfries. A row of shabby buildings partially intercepting the view from the High-street has been removed. The style of the church is Second Pointed. The principal or entrance-front faces the High-street, and the central feature in the façade is a tower, surmounted by a spire, the height in all about 180 ft. The main tower is flanked right and left by small circular towers, in which are staircases leading to the galleries. These towers are interspaced with buttresses, surmounted with crocketed pinnacles. Adjoining the staircase towers, rise the angular gables of the aisles. The tower windows are filled with tracery, and the upper portion of these gables is filled with triple windows, the piers of which have pillars with enriched capitals. Between the staircase towers and the aisle gables rise octagonal spirelets to the height of 80 ft. The interior is entered through a vestibule about 14 ft. square, with a groined ceiling. The building is seated for about 1,050, but a much larger number could be accommodated. The dimensions are about 70 ft. by 63 ft. The nave and transepts are each about 31 ft. wide, and the aisles 15 ft. wide. The clustered pillars which support the nave walls carry the gallery front. At the southern end of the gallery, and fronting the pulpit, are the magistrates' seats, the orchestra, and the organ-gallery. The large north-west window has been filled with stained glass, the gift of Mr. John Lindsay Scott. The window has six upright compartments, which contain illustrations of leading incidents in the life of our Lord. This work has been executed by Messrs. James Ballantine & Son, of Edinburgh. The whole of the other windows throughout the church are filled with cathedral tinted glass, having stained-glass borders, the latter being executed by the same firm.

Kirkwall Market-Cross.—The Market-Cross of Kirkwall, Orkney, was blown down during a recent gale of wind, leaving only a small stump standing above the steps. The Cross was a freestone erection, of about 6 ft. in height, and bore the date 1621.

The House o' Airlie.—The Earl of Airlie intends, it is said, to erect another mansion, contiguous to the site of the famous old castle, "the bonny House o' Airlie" of the well-known Scottish ballad. The new edifice will cost from seventy to eighty thousand pounds, and the work has been entrusted to an English architect.

CHURCH-BUILDING NEWS.

Heigham.—A meeting of the inhabitants of the new district parish of St. Philip, Heigham, has been held, for the purpose of considering the present entire want of church accommodation, and to take steps for the erection of a church. The meeting resolved that steps be at once taken to build a church to hold 800, at a cost of 4,000*l.*, and a committee was appointed to carry out the purpose of the meeting.

Rosemarket.—Alterations and improvements have been recently effected in the parish church of Rosemarket, Pembrokeshire, from the designs of Mr. E. H. Lingen Barker, architect, of London and Hereford. The chief additions consist of a western bell-tower and vestry. The execution of the works has been carried out by local tradesmen.

Alford.—The Church of Alford, which is of the time of Edward III., has been restored, and re-opened by the bishop of the diocese. The accommodation was very meagre, and the seats most uncomfortable. The restoration and enlargement, by building a new north aisle, have been carried out by Messrs. Hasnip & White, under the superintendence of Mr. Geo. Gilbert Scott. The dimensions of the church are,—nave, 59 ft. by 20 ft., divided into four bays, by arcades of octagonal columns and deeply moulded arches, having north and south aisles, 59 ft. by 9 ft., and a new north aisle, 59 ft. by 16 ft. 6 in. The chancel is 44 ft. deep by 20 ft. wide, and the minister's vestry and organ-chamber are 29 ft. long by 13 ft. wide. The organ-chamber opens out into the chancel with lofty arches. The style adopted is Second Pointed, the windows and other architectural details being as nearly as could be ascertained of the date of the original building. The arches of the nave and chancel are moulded, having foliated capitals and moulded bases. The tower side of the chancel arch seems originally to have contained in painted colours our Lord and the Twelve Apostles. The lower arch is of great depth. The large east window is of five lights, the upper part of which is filled in with tracery of elongated quatrefoils. On the north and south sides of the nave there are three windows of three lights each, square-headed, with perpendicular tracery. In the new north aisle the east and west windows are of four lights each, pointed, with perpendicular tracery. In the chancel there are one window on the north side, and two on the south side, with a low side window; when and why the latter was introduced is a question. The tracery in the chancel windows is to be filled in with the remnants of the old stained glass. The roofs are open, of high pitch, stained and varnished. The chancel roof is of stained Baltic oak, in the wagon-headed shape, and the principals are moulded and supported by carved figures. The chancel rises one step, and at the end of the choir there is a rise of two steps, then other two steps for the sacrarium, which is separated by carved oak altar-rails. The seats are of Baltic oak, and open, with the ends carved, of three different designs, and fixed on a wooden floor. The middle aisle is flagged with ancient tombstones, the other aisles and tower-porch being paved with Godwin's red and black tiles to various patterns. The body of the chancel is also laid with the same class of tiles, and the upper part with Godwin's encaustic tiles. The windows are glazed with pale green cathedral glass, in small diamond lead quarries. The exterior has been cased with dark green sandstone from the Worlaby quarries, with the exception of the north, south, and east sides of the tower, which has been pointed only, to show the fact of the restoration. The roofs are covered with pale Westmoreland slates, having moulded stone ridges, and the gable-ends being surmounted by pinnacles and crosses of various designs. The new doors are of oak, and are hung on wrought-iron hinges from the Mediæval metal works of Messrs. Peard & Jackson, of London. The gas standards are from the same works. The church is to be heated by four stoves. A memorial window is likely to be erected at the east end of the south aisle. The chancel stalls and screens are of wainscot. The accommodation in fixed sittings is for about 600, but the church is capable of accommodating about 750 persons. The green sandstone has been presented by Mr. A. Nelson, the light stone for the angles and window mullions, &c., is from the Ancaster quarries. The new gargoyles and heads on the corbel stones on either side of the doors and windows have been carved by Messrs. Ruddock, of London, and the tracery under the superintendence of Mr. J. Turner, of Liverpool.

Hailsham.—A committee has been appointed by the ratepayers to consider as to the dilapidated state of the parish church and its repair. From an estimate prepared by Mr. E. Christian, architect, it seems that about 1,000*l.* or 1,100*l.* will be required as follows:—South aisle, repairing roof, opening out and making good the timbers, and retiling, 165*l.*; repairs of south and west walls of the aisle, which require almost rebuilding, including the renewal of the windows in stone of proper character, 290*l.*; remodelling and repair of south porch, 65*l.*: opening and repairing roof of nave and joining new ceiling between the rafters, 185*l.*; repairs to roof of north aisle, 140*l.*; repairs to walls and restoration of windows, 96*l.*; opening out of the archway of tower, restoring the window, replastering walls, and renewing floor, 95*l.*

Wavertree.—The foundation-stone of a new chapel-of-ease to Holy Trinity Church, Wavertree, has been laid. It is to be called St. Bridget's. The proposed church will be surrounded on the west, north, and east sides by Bagot-street, Lawrence-street, and Thorneycroft-road respectively. The dimensions of the edifice are,—Breadth, 60 ft.; length, 126 ft.; the east end terminating with a semicircular apse or tribune the full width of the nave. The nave will be 93 ft. by 34 ft., and 47 ft. high to the ceiling; will be divided longitudinally into nine bays, and transversely into three bays or divisions; the ceiling being horizontal, and partitioned into twenty-seven sunk and enriched panels, surrounded by a deep cornice. The columns in the nave and at the entrance of the tribune (eighteen in all) will have shafts of Irish red marble. The height from the floor to the springing of the arches above the capitals will be 17 ft. 6 in. in the nave, and 28 ft. at the opening of the tribune. The principal entrance will be in Bagot-street, through an arched opening 11 ft. wide, leading into a vestibule or narthex 37 ft. by 8 ft., which will be vaulted in brickwork and decorated with panelling. A tower to contain a peal of bells is proposed to be built at the north-west corner of the church. The vestries will be placed at the south-east, and separated from the chancel by an arcaded screen. The organ is proposed to be placed in the opposite bay or division, on the north side. The church proper will be lighted by forty-five windows, twenty-one occupying the clearstory, and they will be filled in with coloured glass. Arrangements will also be made for lighting the church at night. There are to be no galleries, but seats provided on the floor for about 800. The choir-stalls, desks, doors, and other joinery will be carried out in Dantzic oak. The characteristic features of St. Bridget's Church are based upon those exemplified in the basilicas at Rome, as affording one of the best means of accommodating a large congregation without interruption to the sight or ear. It is intended, so soon as the requisite funds are provided, to enrich the interior walls and ceiling with coloured decorations, and the architect has prepared a perspective view in water-colours, showing what is proposed to be done. The requisite designs for the building, with the window-glass, furniture, and decorations throughout, are being executed by Mr. Edward A. Heffer, of Liverpool, architect. The contract has been let to Messrs. Nicholson & Ayre, of Liverpool. The brickwork will be carried out by Messrs. Mackinson & Glover; masonry by Mr. J. Grindrod, slating and plastering by Mr. William Callaghan; the marble columns being supplied by Mr. Stubbs. The sum subscribed to carry out the design is 5,200*l.*, leaving about 1,400*l.* to be raised to meet the expense of the work.

ROMAN CATHOLIC CHURCH BUILDING NEWS.

Ross.—The school-chapel, at the rear of the Rev. Dr. Marshall's residence at the Crofts, Ross, has been opened for divine worship. The building, which is a very plain one, measures 50 ft. by 22 ft., and will, we understand, accommodate about 200 persons. The interior presents the usual appearance of a Roman Catholic chapel. The sanctuary is divided from the body of the chapel by a step and curtains. The altar is a temporary one, and over it is a life-size crucifix, made of Herefordshire oak, and presented by the Rev. Dr. Vaughan, of Belmont Priory. Mr. F. Vaughan has also presented statues of the Virgin Mary and St. Joseph. The builder was Mr. William Parry, of Goodrich. The bell was obtained from the establishment of Mr. Smith, ironmonger, Ross.

Ancoats.—The corner stone of a new chapel has been laid on a site in George Leigh-street, Ancoats. The edifice will be a brick one, and the style Early English. The frontage will be in George Leigh-street, from which there will be three entrances, one to the nave and the others to the aisles. Over the centre entrance will be a large three-light window; there will be a two-light window on each side of the centre doorway, and a trefoil window over the aisle doors. A small bell-turret will surmount the western façade. At the east end there will be a three-light window, and also one looking into the Lady Chapel. The edifice will be also additionally provided with dormer lights along the aisle roof, and the clearstory windows will also afford some accommodation in this respect. The nave will be disposed into five bays, with pillars of polished red granite. The total length of the building will be 87 ft. 6 in., and the breadth, 61 ft.; while the height, from floor to top of belfry, will be 71 ft. 6 in. The Lady Chapel will be at the north-east corner, and the vestry at the south-east, and there will be accommodation for about 1,000 persons. The expenditure, exclusive of fittings, will be 2,000*l.*, and the land will cost 1,200*l.* The architect is Mr. W. Nicholson.

STAINED GLASS.

St. Mary's, Bury.—The stained glass with which the west window of the north aisle of this church has been filled is a memorial of the late Misses Harrison. The lights below the transom are occupied by one subject, the Last Supper. The upper lights are filled with representations of the following incidents preceding and commencing the history of our Lord,—namely, the arrival of Mary and Joseph at the inn at Bethlehem, the adoration of the Magi, and the flight into Egypt. In the upper traceries are angels bearing a scroll, and above these other angels holding musical instruments. The symbolical Alpha and Omega also appear, and the emblem of the Holy Spirit in the apex of the window. The window was supplied by Mr. H. Hughes, of London, the donor being Mr. J. Harrison Allan, who inherits the property of the ladies to whose memory it is inserted.

Leeds Parish Church.—A memorial window, of stained glass has been recently placed in the north corner of the west gallery of this church. The subject of the first light is the Good Samaritan; of the centre light, our Lord healing the Lame Man at the Pool of Bethesda; and of the third light, St. Peter raising Dorcas. The ground-work is composed of the passion-flower and leaves, and below is an inscription in memory of Mr. Samuel Smith, well known as an eminent practitioner, and for many years the senior surgeon of the General Infirmary at Leeds, a member of the congregation, and churchwarden of the parish. Messrs. O'Connor, of Berners-street, London, are the artists, and the window is presented by the sons of Mr. Smith.

Miscellanea.

Accident with a Balcony.—A Greek gentleman, the other day, was leaning on a balcony at Brighton, when it gave way, and he was precipitated to the pavement.

The London Artisans' Club and Trades' Hall Company.—A public meeting on this subject has been held at the Cleveland Hall, Fitzroy-square, Mr. M'Cullagh Torrens, M.P., in the chair. There was a large attendance. The Rev. Henry Solly detailed the objects of the promoters of the company, who were all working men. It was proposed to lease or build a hall in a central part of London, capable of holding at least 1,000 persons seated, with library, reading-rooms, and refreshment-rooms, attached, for the use of trade, benefit, and other societies. The shares were 1*l.* each, payable by instalments of 2s. 6d. per month. Up to the present time 250 shares had been taken up by 140 persons, and as soon as 200 shareholders had been enrolled, a meeting would be called to elect the directors. A resolution approving the scheme, and pledging the meeting to its support, was unanimously agreed to.

The Monument to Abraham Lincoln.—The National Lincoln Monument Association have adopted the design of the American sculptor, Larkin G. Mead.

Photographs of Egyptian Antiquities.—The photographic mission sent by the North German Federation into Upper Egypt, under the direction of Dr. Dumichen, to take photographs of a series of antique monuments and inscriptions, lately left Cairo on board the *Aigle*, which navigates the Nile under the flag of the Confederation.

Re-opening of the Central Exchange Newsroom, Newcastle-upon-Tyne. — This building has been re-opened on its restoration from the ravages of fire. Only few alterations have been made on it as left by the late Mr. Grainger, its architect. The light is a little stronger, and the room more lively. The massive pillars, formerly painted in granite, now represent marble. In a short time the triangular block of buildings will present its former appearance, and even the dome at the south-eastern extremity will, thanks, chiefly, to Alderman Dodds, be restored. The entire work connected with the restorations has been carried on in accordance with the directions of Mr. Wm. Parnell, the architect, by Mr. Francis Jackson, as contractor.

The Great Yarmouth School of Art.—The prizes awarded to this school at the annual examination in March last have been presented to the successful students at the Town-hall, by the Mayor. The honorary secretary, Captain Cubitt, said, with regard to the general progress of the schools of art and navigation, that in both a decided progress had been evinced during the last as compared with the previous year, both in the number of pupils and the results as exhibited at the last examination. In the school of art, the number had increased, especially of artisans. This was the more satisfactory to this school, for though used by all classes in the town, it was particularly designed for the improvement and culture of the artisan classes. Hitherto the school had not been used to the extent it was desired by this class, but, thanks to the present excellent master, Mr. Dominy, they had succeeded in attracting a very respectable number.

The Metropolitan Asylums' Board. — The board of managers of the metropolitan asylums' district met on Saturday for the first time since the vacation, at the board-room of the Metropolitan Board of Works, Spring-gardens. Dr. Brewer occupied the chair. Letters were received from the Poor-law Board, approving of applications to the Public Works Loan Commissioners for 15,500*l.* for the purchase of the site at Stockwell, and for 128,000*l.* (or 64,000*l.*, a moiety thereof) for the purposes of the Leavesden Asylum. The finance committee reported that having had under their consideration the question of the contribution to be assessed upon the several parishes and unions to meet the demands upon the managers, they recommended the levying of a rate of one-eighth of a penny in the pound, to be payable on the 25th December of the present year. The report was adopted.

Gas Heat for Steam.—In one of the piles of warehouses belonging to the London and St. Katherine Dock Company, in Cutler-street, steam machinery has been introduced, the different fire offices having approved Jackson's patent, by which the boiler is heated by gas instead of coals. The east area of the dock company's premises will henceforth be worked by the steam lift, without any additional premium being incurred by its adoption. The boiler is placed in a small house built out from the top floor between two warehouses; for there is this stipulation, that even the safe gas-furnace shall not be actually inside the walls, among the merchandise. A considerable length of pipe is therefore necessary through which the steam passes before it can be brought to bear on the engine; but the tube is covered with a coating which is so good a non-conductor that the radiation of heat is very trifling. The circular furnace beneath the boiler contains a series of burners which, when they are all lighted, will raise steam to 50 lb. from cold water in twenty-five minutes. The burners may then be extinguished with the exception of one or two, which are sufficient to keep the pressure-gauge stationary, until power is wanted, when instantaneously the furnace is rekindled, and the engine set in motion. The lift is 65 ft. from the ground below, and more than 500 chests of tea are raised in an hour.

Utilization of Sewage.—Mr. R. B. Grantham, C.E., has been commissioned by the British Association for the Advancement of Science, to draw up annual reports on the treatment and utilization of sewage in connexion with the drainage of towns, in order that such facts and information as may guide future operations may be recorded from time to time. He is requested to include in the details of each report—1. The special circumstances of each case, such as the extent of the district, the population, and the number of houses with or without the benefit of drainage. 2. The character of the sewage and water supply adopted in the district, and the quantity of sewage at disposal. 3. The mode of disposing of the sewage, with description of the works, and their cost. 4. The result pecuniarily to the district, and to those who are selling or applying the sewage to the land or otherwise, in any form whatever. We anticipate much advantage from this undertaking.

The Consumption of Smoke.—A copy of Mr. Rawlinson's report to the Home Secretary of his recent inquiry as to the alleged neglect of the town council of Hanley to enforce the smoke clauses of the Sanitary Act, 1866, has been received by the town clerk from the Home-office, together with a letter from Mr. T. Taylor, who writes:—"I am to request the early consideration of the report by the council, and to state that the clauses for the prevention of smoke, as embodied in the Sanitary Act, 1866, must be duly and properly enforced." Mr. Rawlinson reports that the allegations of the memorialists have been substantiated by the evidence adduced at the inquiry, and that the town council had taken no effective steps to enforce the Act prior to his first visit in July. They had now taken the preliminary steps, and had promised to carry out the Act as far as practicable. Time would be required to make certain structural and other alterations in furnaces and chimneys, and Mr. Rawlinson thinks that a year from the 1st of November next may reasonally be allowed for this purpose. Immediate action should, however, be taken to enforce the law against the worst cases, and this action should be continued. Mr. Rawlinson points out that the consumption of smoke has been proved to be practicable, and says where it is earnestly enforced, as in London and other places, the results are alike beneficial to the manufacturers and the general public. If the towns do not now act for themselves they may expect the interference of other powers.

The Working Classes and Trades' Unions.—The proceedings at the late International Congress of Workmen give interest to an article entitled "*Les Associations Ouvrières en Angleterre*," by Dr. Montucci, which has just appeared in the September number of the *Revue Britannique*. We glean from it the following curious calculation, by which the author endeavours to show what the workman gains by contributing to a trades' union:—Taking the most common case, that of wages ranging between 30*s.* and 40*s.* a week, suppose the workman to pay into the savings bank the 4*s.* a week he now pays into the union; there his money will, at the lowest, produce 3 per cent. interest, payable every six months. As the workman gets nothing in that shape from his union, it is but fair to admit that, in the case under consideration, he leaves his interest to accumulate in the savings bank. Now, calculating the produce of his capital at compound interest, with the regular weekly increase of four shillings, the workman, at the end of twenty years will find himself in possession of a sum of 380*l.* Allowing for illness and other mishaps, let it be 300*l.* Now, it is clear that, with such a capital at command, a shop may be opened, some profitable business or other may be carried on by the wife, while the husband, not older than 50, perhaps, at the time, earns his wages as usual at his master's establishment, with the certainty of having secured comfortable means of living for his old age. Comparing this hypothetical state of things with the real one, the author of the article shows that the workman who contributes to the union fund at the end of the twenty years has nothing; that by belonging to the association he loses not only the 10*l.* a year to which his subscription amounts, but also, on an average, three months' work per annum, in consequence of strikes and other direct or indirect interference with the regular course of business; so that his means are reduced to 72*l.* per annum, instead of 110*l.*, as they would be in the former case.—*Galignani.*

The Clock-tower, Leicester.—The Haymarket Memorial Clock-tower Committee, in closing their labours, have presented a report to their subscribers, congratulating them on the successful attainment of their object. The committee believe that the memorial "will bear favourable comparison with any similar architectural work in the kingdom, and which will thus prove a permanent monument to the honour of the four eminent benefactors represented on the building, as well as to the designer, the executants, the subscribers, and the town at large. The total amount subscribed was 872*l.* 2*s.* 9*d.*

Experiments with Sewage at Wrexham.—Lenk's purifying process has been tried at Wrexham. It is one of precipitation, by means of sulphate of alumina with alum and water. The result seems to have been that the most offensive portion of the sewage was precipitated, leaving a milky solution of tolerable purity. The mixture is put to the sewage, one part to 1,000, and the cost is one penny per 1,000 gallons of sewage, which would amount to a considerable sum a year for the deodorization of the Wrexham sewage, towards counterbalancing the proceeds from the sale of the deposit. That, however, is not the chief consideration.

General Union of Carpenters and Joiners of Great Britain.—The members of the city of Gloucester lodge of this society have held their annual dinner at the Talbot Inn, Gloucester. About thirty members and friends attended. Brother England was called to the chair, and Brother Panter to the vice-chair. The usual toasts were given, and the toast of "Success to the General Union" was drunk with enthusiasm, and responded to by Mr. Robert Last, general secretary of the union. The toast of "Success to the City of Gloucester Lodge" was proposed, and responded to by the lodge secretary, who gave a financial report of the income and expenditure for the year ending July 31st, 1868, and stated that the lodge was making steady progress. "Prosperity to the Master Builders of Gloucester" was given, and honoured.

The Government and the Telegraphs.—At the last weekly meeting of the Metropolitan Board of Works, the clerk to the Board read a letter from Mr. Scudamore, of the General Post-Office, stating that the Postmaster-General (the Duke of Montrose) was now considering the arrangements which would be necessary to construct the system of Post-office telegraph communication contemplated by the Act of last session; and that it was believed that the subways and sewers belonging to the Board could be made use of to a great extent, and required the Board to favour his Grace with a plan showing the direction of any sewer or subway which might appear suitable for the purpose, and any suggestions. Mr. Pollard added that instructions had been given to Mr. Bazalgette to supply the plans asked for. Mr. Cyrus Taylor thought that they should receive in return facilities for communication between the various Fire Brigade stations.

Paris Art Schools.—At the distribution of prizes to the pupils of the Municipal School of Drawing and Sculpture, M. Robert Fleury, who presided, said that up to 1830 only one school of art existed for the working classes, and that at the present moment there are fifty evening schools of art in Paris, where more than 4,000 pupils can study; the models chosen, with care, by a commission, are sent to all the schools; rewards are given by the municipal authorities; and the most meritorious pupils receive prizes of honour from the Emperor. The Prefect of the Seine has caused large school-houses to be built to replace those whose accommodation had become insufficient. The school of the Rue des Petits Hôtels, which is one of these, has room for 3,000 pupils. M. Robert Fleury referred to the courses of geometric drawing, sculpture, and elementary anatomy, established by M. Lequien, and said that the education given in these schools answered all the wants of the industrial arts. "Continue, then," said M. Robert Fleury, "to profit by the encouragement which is offered to you; make free use of the advantages which the country and the Government place at your disposal, and all difficulties will give way before your perseverance. Imbibe as much as possible of the spirit of the best models of antiquity and of the Renaissance; exercise yourselves in composition and invention; but remember that, though fancy is admissible in industrial art, it should never overstep the limits of good taste."